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W.O.  
1891

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# HANDBOOK

OF THE

## 6-INCH "B" Q.F. GUN.

LAND SERVICE.

1911.



LONDON:

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

To be purchased, either directly or through any Bookseller, from  
WYMAN AND SONS, LTD., FETTER LANE, E.C.; or  
OLIVER AND BOYD, TWEEDDALE COURT, EDINBURGH; or  
E. PONSONBY, LTD., 116, GRAFTON STREET, DUBLIN.

PRINTED BY

MACKIE AND CO., LTD., WARRINGTON AND LONDON.  
1911.

Price One Shilling.

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NOTE.—This book has been corrected up to June, 1911. Any alterations which may be suggested should be forwarded to the Chief Inspector, Royal Arsenal, Woolwich.



# HANDBOOK

OF THE

## 6-INCH "B." Q.F. GUN, MARK II.

LAND SERVICE.

### GUN.

(Plate I.)

Material	...	...	...	...	steel (wire construction).
Weight	...	{ of gun without breech mechanism	...	...	6 tons 10 cwt.
	...	{ of gun, nominal	...	...	7 tons.
Length, total	...	...	...	...	249.25 inches=41.54 cal.
Position of centre of gravity (without breech mechanism)					
	...	...	...	...	82.9 inches from face of breech.
Bore	...	{ calibre	...	...	6 inches.
	...	{ length (to face of breech screw)	...	...	240 inches.
Chamber	...	{ Length to base of shot	...	...	22.537 inches.
	...	{ Diameter { largest	...	...	7.045 inches.
	...	{ smallest	...	...	6.335 inches.
	...	{ Capacity of cartridge case to base of lid	...	...	498.33 cubic inches.
Rifling Mark I	...	{ system	...	...	polygroove, hook section.
	...	{ length	...	...	214.16 inches.
	...	{ twist	...	...	Increasing from 1 turn in 60 calibres at breech end of rifling to 1 turn in 30 calibres at muzzle.
	...	{ grooves { number	...	...	24.
	...	{ depth	...	...	.05 inch.
	...	{ width	...	...	.6 "
	...	{ system	...	...	polygroove, modified plain section.
	...	{ length	...	...	214.16 inches.
* Rifling Mark II	...	{ twist	...	...	straight from breech end of rifling to 178.7 inches from the muzzle, then increasing from 0 to 1 turn in 30 calibres at muzzle.
	...	{ grooves { number	...	...	24.
	...	{ depth	...	...	.05 inch.
	...	{ width	...	...	.39 "
Firing Mechanism	...	...	...	...	electric and percussion.
Ballistic effects	...	...	...	...	see range table.

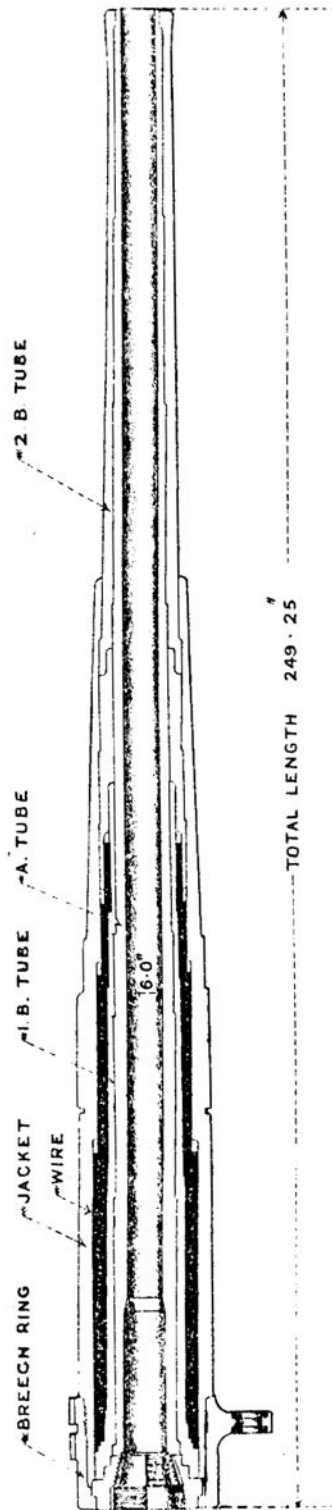
### GUN BODY.

The gun is without trunnions and is made entirely of steel. It consists principally of an A, 1B, and 2B tubes, B hoop, jacket, breech bush, and breech ring, and a number of lengths of flat steel wire worked round the 1B tube.

\* For guns of future manufacture, also when "through lined," or re-tubed.

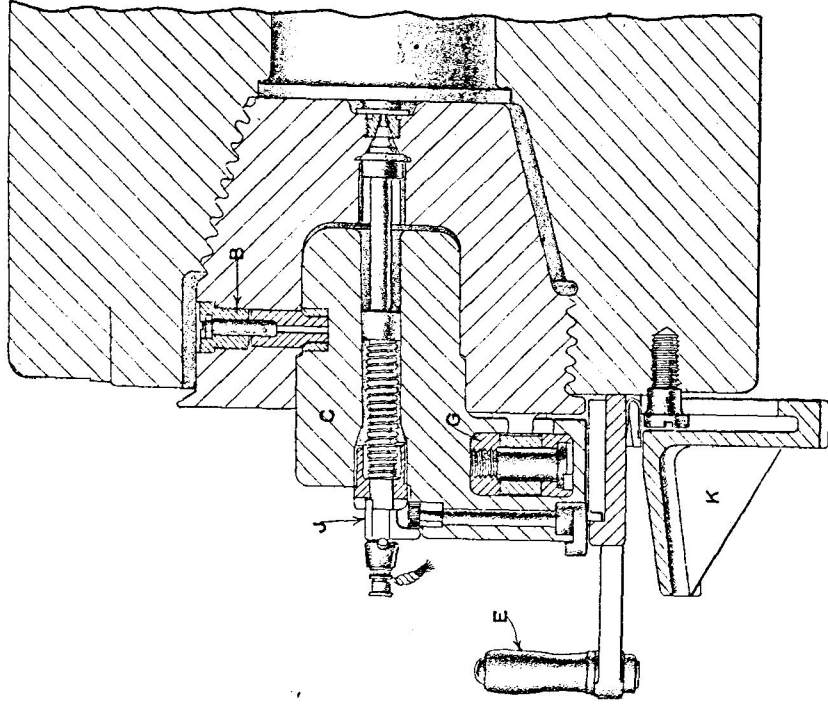
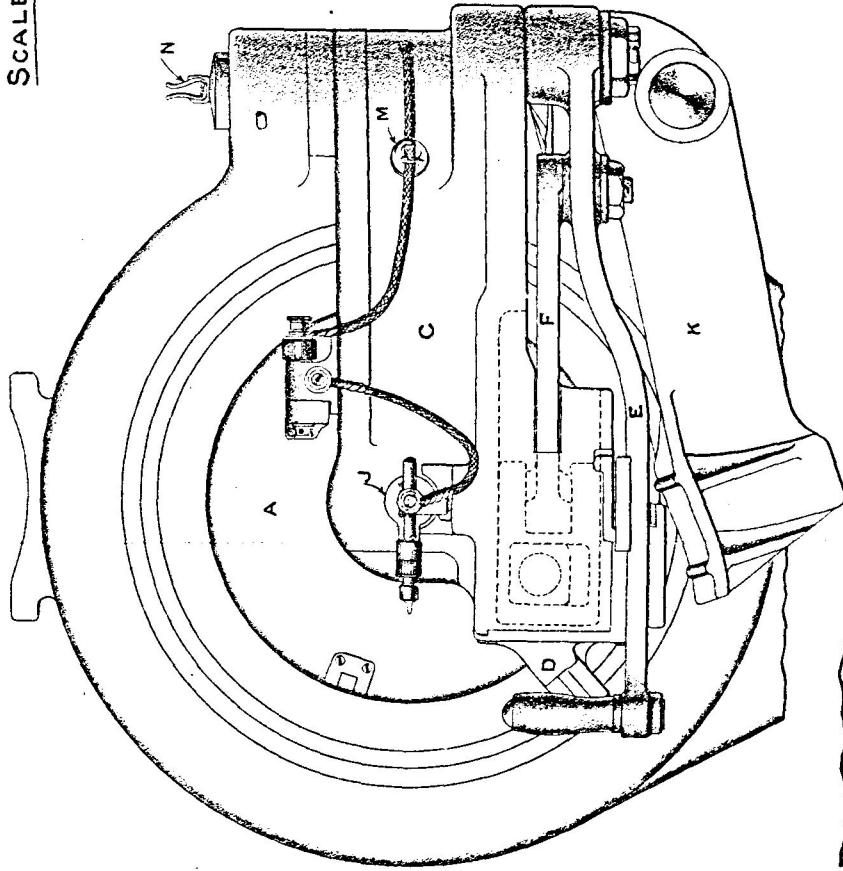
# ORDNANCE, Q. F. 6 INCH, "B," MARK II.

SCALE = 1/32

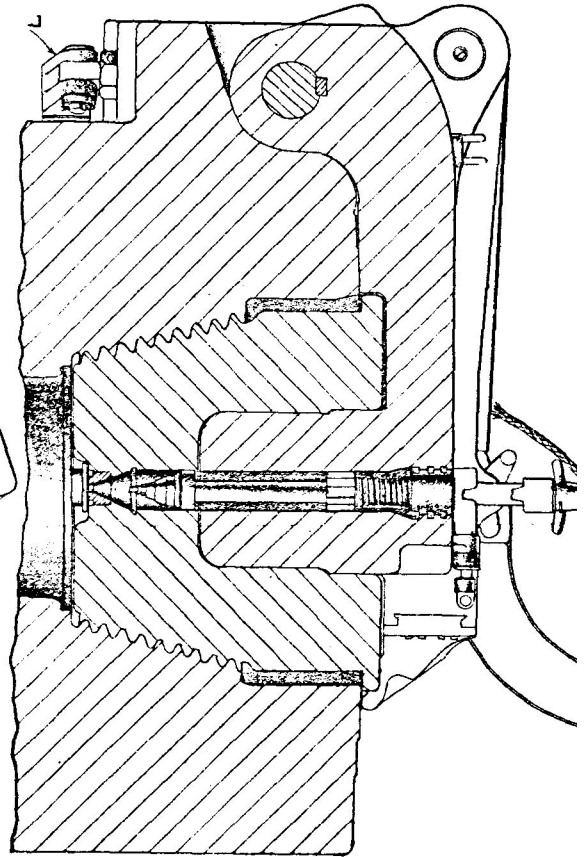


# ORDNANCE, Q.F. & Q.F.C. 6 INCH "B" GENERAL ARRANGEMENT OF BREECH MECHANISM.

SCALE = 1/8.



- A. BREECH SCREW.
- B. SCREW, FIXING, BREECH SCREW.
- C. CARRIER.
- D. CATCH, RETAINING, BREECH SCREW.
- E. LEVER, BREECH SCREW.
- F. LINK, ACTUATING.
- G. SLIDING BLOCK.
- H. BUSH, SLIDING BLOCK.
- I. SAFETY STOP.
- J. STRIKER.
- K. SHOT GUIDE.
- L. EXTRACTOR.
- M. HOOK, SUPPORTING, CABLE.



Over the A tube is shrunk the 1B tube, which is secured longitudinally by corresponding shoulders, and a screwed steel breech bush at the rear; the bush is also prepared for the reception of the breech screw. Round the 1B tube are wound successive layers of flat steel wire, the ends of which are secured to steel rings provided for that purpose. The B hoop and 2B tube are shrunk round the A tube in front of the 1B tube extending to the muzzle, the B hoop overlapping portions of the wire and 1B tube. The jacket is fitted over the wire, B hoop, and a portion of the 2B tube, and is secured longitudinally by corresponding shoulders on the B hoop and 2B tube, and by the breech ring, which is shrunk round a portion of the breech bush and screwed to the jacket at the rear.

The breech ring is furnished with a lug on the underside for the attachment of the gun to the hydraulic buffer of the mounting.

Projections are formed on the upper side of the breech ring for the attachment of the gun to naval mountings, but these will not be used when the gun is mounted on land service mountings.

The exterior of the jacket is furnished with longitudinal projections, forming guides for the gun when in the cradle of the mounting.

The chamber is slightly coned so as to facilitate the insertion and extraction of the cartridge.

Two planes for clinometer are prepared on the upper surface of the gun, the original plane being immediately in front of the guide projection. The other plane is on the breech ring at the rear.

Axis lines are cut on the face of the muzzle and of the breech.

The actual weight of the gun is engraved on the top of the jacket in front of the breech ring, and the Royal monogram on the chase.

The nature, mark, registered number, manufacturers' initials, and year of manufacture, are engraved on the upper portion of the breech face.

## BREECH MECHANISM.

(Plate II.)

The mechanism is so arranged that by one pull on a lever the breech screw is automatically unlocked, withdrawn and swung clear for loading. After loading, one thrust on the same lever inserts the breech screw and turns it home; at the same time the striker is retained in a position of safety until the breech screw is securely locked and the breech mechanism lever home.

The names of the principal parts of the breech mechanism are shown on Plate II.

## DESCRIPTION OF BREECH MECHANISM.

*Breech screw.*—The breech of the gun is closed by a steel screw, cylindrical in form at the rear end, but tapered in front to give the necessary clearance to admit of the screw being swung direct from the unlocked to the loading position or *vice-versa*.

The parallel and conical parts of the breech screw have three portions of the thread removed longitudinally, the divisions in relief on the conical portion being opposite the plain portions of the

parallel part, for the purpose of distributing the strain. The breech opening of the gun being prepared in a corresponding manner admits of the screw, when the raised portions are placed opposite the smooth surfaces in the gun, being swung home and locked by the sixth of a turn. The screw is prepared to receive the projecting portion of the carrier and striker.

To prevent injury to the screw threads of the breech screw and breech opening by the rapid and frequent closing of the breech, the leading edges of the threads are rounded off.

The rear face of the breech screw is fitted with a hard steel piece, having a recess to engage with the "catch retaining breech screw."

Upon the rear face is formed a stud to engage with the gunmetal bush of the sliding block.

*Carrier.*—When the breech screw is withdrawn from the gun, it is supported by means of a bronze carrier, hinged to the right side of the breech ring, and working upon a bearing washer.

Upon the front of the carrier is a large cylindrical projection, forming a pivot for the breech screw, which is secured thereon by a fixing screw, the inner end of the screw works in a groove lined with hard steel, and is arranged so as to admit of the breech screw being revolved in opening or closing the breech.

Inside the above projection a recess is prepared to receive the striker, and interrupted thrust collars are formed at the rear end to engage with those on the striker retaining nut.

The lower part of the carrier is recessed to receive the sliding block and link; the metal in front is also cut away to enable the stud of the breech screw to engage in the gunmetal bush of the sliding block.

On the front of the carrier hinge at the top an eccentric is formed for actuating the extractor.

A recess is formed in the rear of the carrier for the reception of the safety stop.

A flat spring, fitted to the underside of the carrier, engages with the breech mechanism lever, in the closed position, and prevents any movement of the lever during firing.

A steel stud is fixed to the underside of the carrier for the attachment of the breech mechanism lever.

*Catch, retaining breech screw.*—To the left side of the carrier is fitted a gunmetal bracket which carries the retaining catch.

The catch consists of a steel lever pivoted in the bracket, and pressed forward by a spiral spring. The inner end of the catch is shaped to engage in the slot in the rear face of the breech screw, and a projection is formed on its front which bears against the face of the breech to force the inner end of the catch to the rear and automatically release the breech screw when closing the breech.

*Lever, breech mechanism.*—The breech mechanism lever is of steel, with a brass handle; it is mounted on a steel stud underneath the carrier, and secured by a castellated nut with keep pin; it is prepared for the attachment of the link, and upon the upper surface of the lever is fitted a plate of hard steel with an eccentric groove to engage the lower stud on the turning lever of the safety stop.

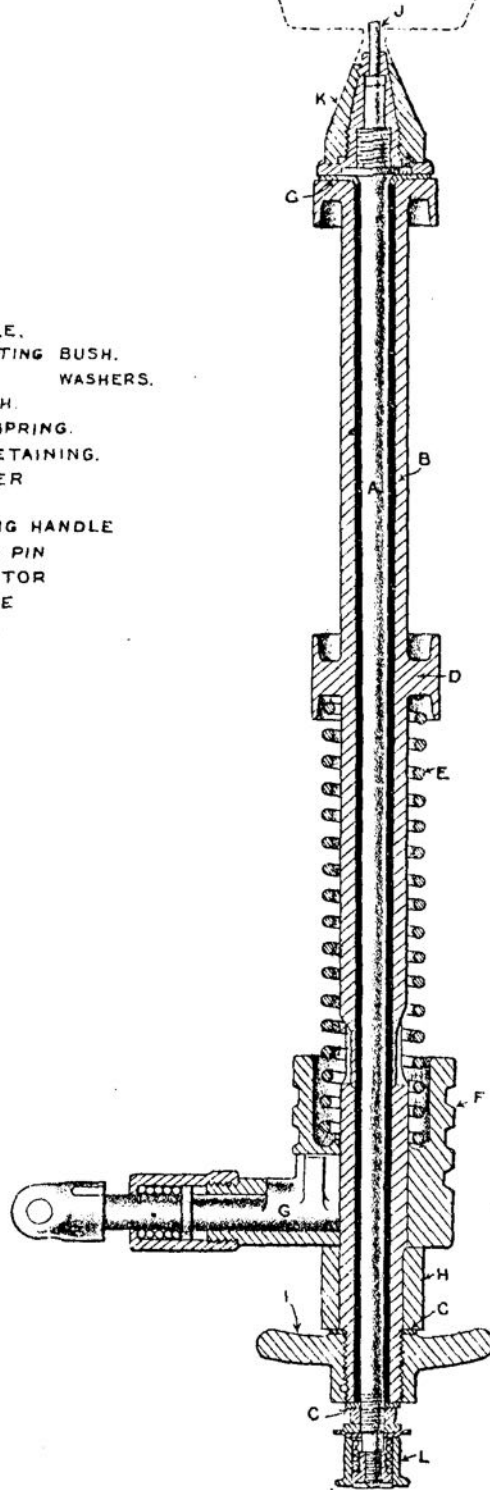
*Link.*—The link is of steel; one end is pivoted on the breech mechanism lever, whilst the opposite end is attached to the sliding block.

# — STRIKER, ELECTRIC & PERCUSSION —

GENERAL ARRANGEMENT

SCALE = 1/2

- A. NEEDLE.
- B. INSULATING BUSH.
- C. " WASHERS.
- D. SHEATH.
- E. MAIN SPRING.
- F. NUT RETAINING.
- G. TRIGGER
- H. HEAD.
- I. COCKING HANDLE
- J. FIRING PIN
- K. INSULATOR
- L. SLEEVE



*Sliding block.*—The sliding block is of steel, rectangular in form; its right side is prepared for the attachment of the link; the opposite end is recessed to receive a gunmetal bush which engages the stud of the breech screw. The bush has vertical play, to enable it to conform to the motion of the stud of the breech screw in turning. A groove is cut along the underside of the block for the reception of the stud on the upper surface of the turning lever of the safety stop.

*Extractor.*—The extractor consists of a steel bolt (projecting through the side of the gun into the chamber at the rear) having a shoulder near the inner end to accommodate the head of the cartridge. The bolt is retained in position by means of a nut screwed into the exterior of the gun on the right side, the end of the hole on the left side (to facilitate the removal of the bolt) being closed with a screwed plug. The bolt is worked automatically by a lever fitted to its outer end, and an actuating bolt with spiral spring and cover which engages with an eccentric formed on the hinge of the carrier in such a manner that when the screw is swung into the loading position, the bolt is partially revolved, thereby releasing the cartridge. The extractor bolt is returned into the loading position by means of the spiral spring on the actuating bolt, while the breech is being closed.

*Hook, supporting cable.*—The hook supporting cable is of bull metal (latest manufacture of steel, nickel plated); it is fitted to the carrier, together with a spring washer, by a securing screw, which admits of the hook being revolved so that the cable may be readily connected or disconnected.

*Clip, supporting cocking lanyard.*—The clip consists of a steel bracket with spring, attached by a fixing screw to the (lubricating hole in the) upper end of the carrier hinge bolt, the existing lubricating screw in the hinge bolt being removed for this purpose.

#### SHOT GUIDE.

A bronze shot guide, to facilitate loading, is hinged by a bolt to the right side of the breech, and is automatically raised to the loading position by means of an inclined plane on the under side of the carrier, when the breech is opened. A stop screw provided on the under side of the breech opening engages with a groove on the inner side of the guide, and serves to support it laterally.

#### FIRING MECHANISM.

The gun is fired electrically or by percussion, through the agency of a striker which is fitted in the projecting arm of the carrier.

The firing mechanism is so arranged as to prevent the gun being fired until the breech is fully closed, the breech mechanism lever quite home, and for percussion firing the trigger of the striker pulled.

The names of the principal parts of the striker are shown on Plate III.

#### DESCRIPTION OF STRIKER.

*Mark I Needle* consists of the following parts:—Part I (spindle), Part II (head), short firing pin, insulator, keep screw, retaining and locking nuts, sleeve, spring, and securing nut, for use with expendable cables. The firing pin<sup>a</sup> being removable can be renewed

<sup>a</sup> Spare firing pins are left .03 inch long to compensate for wear in the mechanism, and to ensure maximum protrusion.



as may become necessary, and the insulator, which is of vulcanized fibre, is fitted round the needle head so as to prevent electrical connection between the needle and the breech screw; Mark IV needles have been brought up to this pattern and are known as Mark IV<sup>o</sup>.

*Insulating bushes, and washers.*—Surrounding the needle is an insulating bush of ebonite in two parts; a hard leather insulating washer intervenes between the head of the needle and the front of the sheath, whilst another leather washer (or in former manufacture, of vulcanized fibre) is placed between the rear end of the sheath and the needle nuts.

*Sheath.*—The sheath is of steel, bored out to receive the needle spindle and insulating bushes; externally at the front end it is enlarged to form a bearing for the needle head, and the mainspring; upon this enlargement are two small feathers to engage in a featherway in the carrier. Two cock notches are formed in the sides of the sheath to engage the trigger in percussion firing. The rear end of the sheath is prepared for the attachment of the striker head, and cocking handle.

*Mainspring.*—The striker is actuated by means of a strong spiral spring placed over the sheath, it bears against the head of the sheath in front and the retaining nut in rear.

*Nut, retaining, striker.*—The striker retaining nut fits over the sheath in the rear of the mainspring. It is of steel and is provided with a circular hole at its centre, through which the sheath passes. Around the exterior of the nut, interrupted thrust collars are formed to engage with those in the carrier.

A projection on the left side of the nut is hollowed to receive the trigger, and is screwed for the attachment of the trigger cap.

Slots are cut in the top and bottom of the rear face of the nut to receive a projection on the front of the striker head by means of which the nut is locked in position.

*Trigger.*—The trigger, which is of hardened steel, consists of a short spindle, enlarged at its inner end, and so shaped as to form a sear to engage (in percussion firing) with the cock notch in the sheath. The trigger is kept up to its work by a spiral spring, and the outer end is provided with a loop for the attachment of the firing lanyard.

The trigger is held in position by a "cap, retaining" screwed over the projection of the "nut, retaining." On the front face of the cap is formed a flat, which, bearing against the carrier when the striker is in position, prevents the cap from becoming unscrewed.

*Striker, head.*—The striker head is of steel and fits over the sheath in rear of the retaining nut. It is prevented from turning by means of a featherway engaging with a feather on the sheath, on its front is a projection which engages in one of the slots in the retaining nut to prevent the nut revolving, and upon the underside is a lug which is engaged by the safety stop in opening the breech.

*Cocking handle.*—Behind the striker head is placed a leather washer, and in rear of this the cocking handle is screwed to the sheath, and further secured by means of a split keep pin.



*Electric firing.*—In electric firing the breech must be fully closed and the breech mechanism lever quite home, because, until then, the "Contacts, electric, safety firing" on the carrier and breech screw do not engage and the striker is not in electrical connection with the firing battery.

*Percussion firing.*—In percussion firing the breech must be fully closed and the lever breech mechanism quite home, because, until then, the safety stop will prevent the striker going sufficiently forward to reach the V.S. percussion tube in the adapter.

The striker is cocked by hand, by drawing the striker to the rear by means of the cocking lanyard until the cock notch in the sheath of the striker is caught and retained by the trigger, the trigger is released by means of a firing lanyard.

The gun can be fired from the right, left, or rear; in the former case, the striker retaining nut after being inserted in the carrier is revolved through a quarter of a circle to the right, until the trigger is horizontal, in the two latter cases it is revolved in the opposite direction.

#### ACTION OF BREECH MECHANISM.

*To open the breech.*—On pulling the breech mechanism lever outwards and to the right the lever is disengaged from its catch retaining; the eccentric groove in the plate, on the lever engaging with the stud on the underside of the turning lever of the safety stop, causes the latter to revolve, and the eccentric lug at its upper end, bearing against a projection on the head of the striker, forces the latter to the rear, clear of the tube and forms a safety arrangement.

During the foregoing movement the stud on the upper side of the turning lever of the safety stop is revolved into the entrance of its groove in the underside of the sliding block, which in the further opening of the breech moves over the stud, and prevents any movement of the safety stop until the breech is again fully closed.

On the further movement of the lever, the actuating link together with the sliding block, gunmetal bush, and stud of breech screw are drawn to the right until the sliding block is checked by coming into contact with a shoulder forming the end of the recess in which it works, thereby forming a stop when the breech screw reaches the unlocked position.

During this movement the breech screw is caused to revolve to the withdrawing position by reason of the stud on its rear face gearing into the gunmetal bush, which being capable of slight vertical movement, conforms to the arc described by the stud of the screw in turning.

When in the withdrawing position, the recess in the rear face of the breech screw comes opposite to, and is engaged by, the "catch retaining breech screw," which retains the breech screw in the correct position ready for closing.

The further movement of the breech mechanism lever causes the carrier and breech screw to swing together to the loading position. During the latter part of this movement, the eccentric on the front of the carrier hinge, pressing against the actuating plate of the extractor, causes its lever and extractor spindle to be partly revolved and the cartridge case started to the rear ready for removal by the "hand extractor."

*To close the breech.*—The action of closing the breech is the reverse of the above.

#### SAFETY APPLIANCES.

*Safety stop.*—A safety stop is fitted to the carrier to prevent the striker going forward and firing the gun electrically or by percussion until the breech screw is in the locked position, and the breech mechanism lever quite home. It consists of a steel spindle, at the lower end of which is a turning lever, having on its underside at one end a stud which gears in an eccentric groove in the breech mechanism lever. On the upper side of the turning lever at its opposite end is another stud, which, when the breech is opened, gears in a groove in the underside of the sliding block. The upper end of the stop is fitted with an eccentric lug which engages the lug on the head of the striker.

*Contacts, electric, safety firing.*—A bronze bracket termed the "Contact carrier" is attached to the upper surface of the carrier by fixing screws secured by serrated locking plates. Within the bracket and projecting from its left side are two insulated contact pieces, to the opposite ends of which are attached the cable "A" belonging to the firing gear of the carriage, and cable, electric, safety firing, respectively.

The "Contact, breech screw" consists of a bronze bracket attached to the rear face of the breech screw by fixing screws and locking plates, and contains an insulated contact piece which is pressed towards the right by a spiral spring. The bracket is fixed in such a position that when the breech screw reaches the locked position its contact piece comes into contact with the two contact pieces in the "Contact carrier" and thus makes electrical connection between cable "A" and "Cable, electric, safety firing."

*Cable electric safety firing.*—This cable (uncoloured) connects the "Contact, carrier" with the striker of the gun.

#### ECCENTRICITY OF STRIKER AND PROTRUSION OF STRIKER.

For instructions and method of using the "Gauge, striker, eccentricity, small" and "Gauge, striker, protrusion, No. 1," see "drill" and "Regulations for Magazines and Care of War Matériel."

#### REMOVING AND REPLACING THE BREECH FITTINGS.

Before removing the fittings, the breech should be opened and the breech mechanism swung into the loading position.

*Striker.*—Pull back the striker until the projection on the front of the head of the striker is clear of the recess in the retaining nut, turn the nut one-fourth of a turn to the right or left; the striker can then be withdrawn.

*Breech screw.*—Unscrew the fixing screw in the breech screw and remove it; the breech screw can then be withdrawn from the carrier.

*Safety stop.*—Remove the locking plate and fixing screw from the upper side of the stop, and remove the upper portion; the lower part can be withdrawn from below.

*Bracket catch, retaining, breech screw.*—Remove the locking plate, also the fixing screws, and remove the bracket with catch.

*Sliding block with bush.*—Take out the fixing screw of the axis pin of the "link actuating," and remove the axis pin; the sliding block and bush can then be withdrawn from the carrier.

*Link actuating.*—Remove the keep pin and nut of the link from the under side of the breech mechanism lever; the link can then be withdrawn.

*Lever, breech mechanism.*—Remove the keep pin and nut from the stud; the lever can then be withdrawn.

*Spring, retaining, breech mechanism lever.*—Take out the three fixing screws, and remove the spring.

*Hook, supporting cable.*—Unscrew the securing screw, and the hook with spring washer is released.

*Clip supporting cocking lanyard.*—Unscrew the fixing screw, and the clip with spring is released.

*Carrier.*—Withdraw the keep pin, and remove the hinge bolt; the carrier can then be withdrawn.

*Extractor.*—Withdraw the keep pin of the axis pin of the actuating bolt, and remove the axis pin with washer. Turn the actuating lever to the right, remove the keep pin, and withdraw the lever from the extractor bolt. Take out the retaining nut of the extractor bolt from the right side of the gun, and the screw plug from the left side; the extractor bolt can then be removed by inserting a drift in the hole on the left side of the gun, and giving it a light blow with a hammer. Take out the fixing screws of the cover; the latter, with actuating bolt and spiral spring, can then be withdrawn.

*Shot guide.*—Remove the keep pin and washer from the axis pin, withdraw the latter, and remove the shot guide.

#### *To dismantle the Striker.*

*To remove the trigger.*—Unscrew the cap; the trigger can be then withdrawn from the striker.

*To remove the needle.*—Unscrew the securing nut at rear end of needle and remove the spring and sleeve. Unscrew the nuts of the needle, and remove the nuts and leather washer. The needle, with leather washer, can then be withdrawn from the sheath.

*To remove firing pin.*—Take out the keep screw from under the head of the needle, when the latter can be unscrewed and removed; the firing pin can then be taken out.

*To remove the main spring.*—Remove the trigger and needle as described above. Remove the keep pin of the cocking handle and unscrew the latter. Take off the washer, steel head, and retaining nut; the main spring can then be withdrawn.

#### *To replace fittings.*

The fittings are replaced in the reverse order.

NOTE.—All removable fittings should occasionally be taken entirely apart and examined in order to ascertain that they are quite sound and in good working order, any in which a crack is observed should be exchanged. They should also be examined frequently as to their condition in respect to wear in order that, if necessary, special examination may be called for.

The electric and percussion striker should be tested to see that the insulation is not defective, and the protrusion of the striker is correct.

### SEPARATE DEMANDABLE STORES.

The proportion of separate stores allowed will be found in the Equipment Regulations.

*Bronze and steel drifts and a lead hammer* are provided for removing and replacing the breech fittings.

*Extractor, cartridge, hand, Q.P. or Q.P.C., large.*—This is made of steel, having a claw at one end to engage under the head of the primer or adapter when extracting the cartridge. A cross handle is provided near the centre, the extractor being formed at the rear end to fit under the forearm when the hand grasps the handle. Total length, 14.4 inches.

*Gauge, striker, eccentricity, small.*—The gauge is of brass, with a removable copper plug, for testing eccentricity of striker in guns using "P" vent-sealing tubes.

*Gauge, striker, protrusion, No. 1.*—This is of steel, for gauging the protrusion of the striker of the gun.

*Rimer, vent, axial, short.*—This is of bronze, and is used for clearing the tube seating in the cartridge adapter.

*Wrenches.*—The following wrenches are employed with the breech mechanism :—

Wrench, breech mechanism—

No. 65	...	...	For large nuts and screws.
„ 66	...	...	For extractor and small screws.
„ 67	...	...	For assembling nut and needle nuts of striker.
„ 78	...	...	For removing and replacing the bush firing hole.

### SIDE-ARMS, &c.

*Brush, Piasaba, 6-inch, No. 2, Mark I.*—The brush is used for cleaning the bore of the gun, in conjunction with a sponge cloth or piece of canvas tied on the head.

The head is of elm, having piasaba tufts secured into it by pitch or marine glue.

The stave is of ash, and is secured in the head by a copper rivet. It is fitted with a metal socket joint, which consists of a metal plug fixed to the stave end, and a metal cylinder fixed to the brush stave; the plug is inserted in the cylinder, and secured in position by a thumb screw fitted to the cylinder.

Total length, with end stave, 23 ft.

*Brush, Piasaba 6-inch, No. 3, Mark I.*—The brush differs in length from No. 2, and is intended to supersede the latter.

*Mark II for future manufacture.*---The Mark II brush differs from Mark I in being built up consisting of several parts. Any one of the separate components of the head may be replaced as required.

Total length, with end stave, 24 ft. 9 in.

*Stave End, No. 18.*---This is for lengthening the stave of the piasaba brushes, as above described; it is of ash, fitted with a metal plug to suit the socket joint.

Length, 11 ft. 3 in.

*Ejector, projectile, Q.F., 6-inch land, Mark I.*---The ejector is used for drill purposes.

The head is of elm, secured to a pine stave by means of a copper rivet; it is fitted with a copper strengthening band, and recessed to clear the nose fuze.

A band for the attachment of guide ropes is fitted to the end of the stave.

Total length, 19 ft. 11½ in.

*Rammer, Q.F. or Q.F.C., 6-inch, Mark II.*---This has a sabieu head, with a metal ring to preserve it from injury by the screw thread of breech; the stave is of ash.

Total length, 4 ft. 6 in.

*Extractor, drill shell, No. 1.*---The extractor consists of an ash stave grooved circumferentially at one end to enable a good grip to be taken when extracting the drill shell. The other end of the stave is furnished with a steel hook for engaging the crossbar of the shell.

Total length, 5 ft.

*Cover, muzzle, No. 5. (For Q.F. 6-inch, and B.L., 6-inch gun and howitzer.)*---The cover is made of waterproofed canvas, and is secured to the muzzle by a leather strap.

*Lanyard, cocking, No. 2.*---The lanyard is of tarred white line 4 feet 6 inches long having at one end a wood toggle, the other end being formed into two loops which are placed over the two projecting lugs of the cocking handle on the striker. When the striker is in the cocked position, the toggle end of the lanyard is placed in a supporting clip provided for the purpose on the upper end of the carrier hinge bolt.

*Lanyard, firing, No. 7.*---This lanyard is used for firing the gun and is also of tarred white line, 8 feet 8 inches long with cylindrical wood toggle and hook for attaching to the loop of the trigger when firing by percussion.

# CARE AND PRESERVATION OF ORDNANCE AND FITTINGS, AND AIMING RIFLE.

See "*Regulations for Magazines and Care of War Matériel.*"

The following is a list of the oil-holes in the gun and fittings which require to have the screws occasionally removed, and oil poured into the channels, so as to lubricate the parts without removal of the fittings. Care must be taken to replace the screws immediately after oiling:—

Fittings to be lubricated.	Position of oil-hole.
Carrier, hinge bolt ... ..	Top of hinge bolt.
" " joint ... ..	Lower part of carrier on right side.
Lever, breech mechanism, axis pin ...	Top of axis pin.
Link, sliding block ... ..	Top of outer end of link.
Bush " " ... ..	Left side of carrier.
Breech screw ... ..	In parallel portion of breech screw.
Extractor, bolt ... ..	In screw plug, left side of gun, at breech.

## AIMING RIFLES.

† RIFLE, AIMING, 1-INCH, MORRIS, Q.F., 6-INCH.

(Plate IV.)

This apparatus is designed for use with either 1-inch or aiming tube cartridges; it is for use with the gun in imparting instructions in laying, and consists of the following parts:—

Rifle, aiming, 1-inch Morris, Q.F.	
6-inch ... ..	steel ... .. 1
Cylinders, anti-fouling, 4·7-inch and 6-inch guns (Mark 1) ...	converted 6 Pr. cartridge case, securing bush, and two set screws ... ..
Tube, 23-inch "C" ... ..	Steel, with nut and washer 1

## TO BE DEMANDED SEPARATELY.

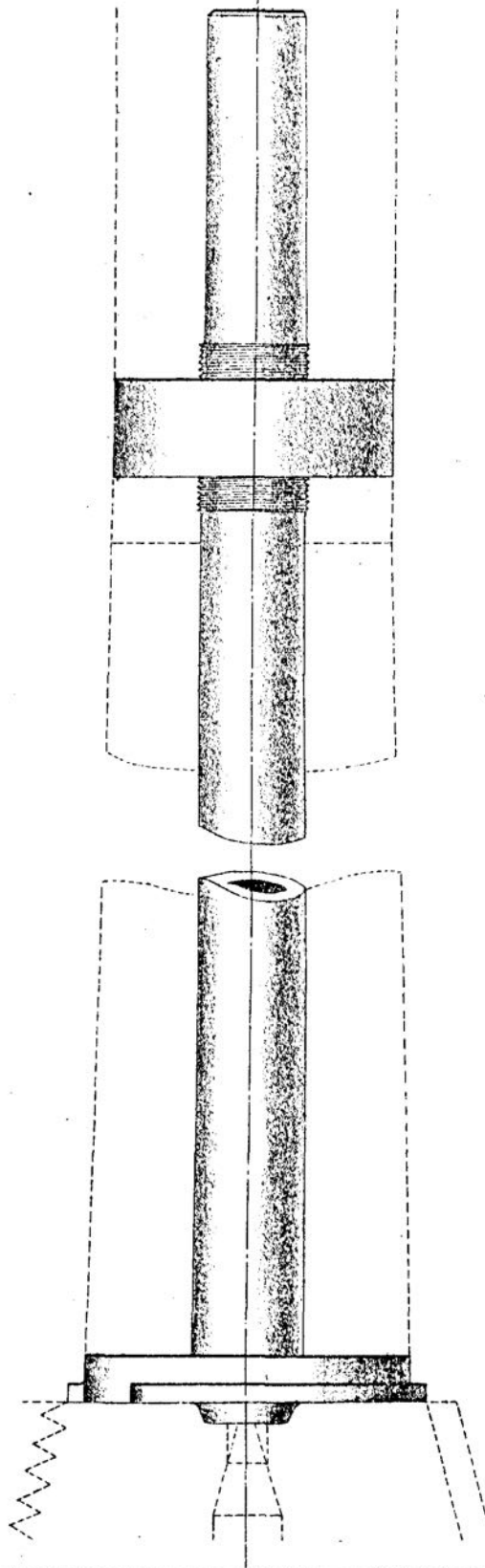
Rifle aiming, 1-inch, Morris, Q.F.—

Extractors, { barrel, steel ... ..	1
cartridge, steel ... ..	1
Rifle, aiming, 1-inch—	
Brush, cleaning, without rod ...	1
Rod, cleaning, wood ... ..	1
Tube, 23-inch—	
Brush, cleaning, without rod ...	1
Rod, cleaning, 36 inches long ...	1

† When unserviceable will be replaced by "Rifle, aiming, 1-inch Elswick, B."

RIFLE, AIMING, 1 INCH, MORRIS, Q. F., 6 INCH.

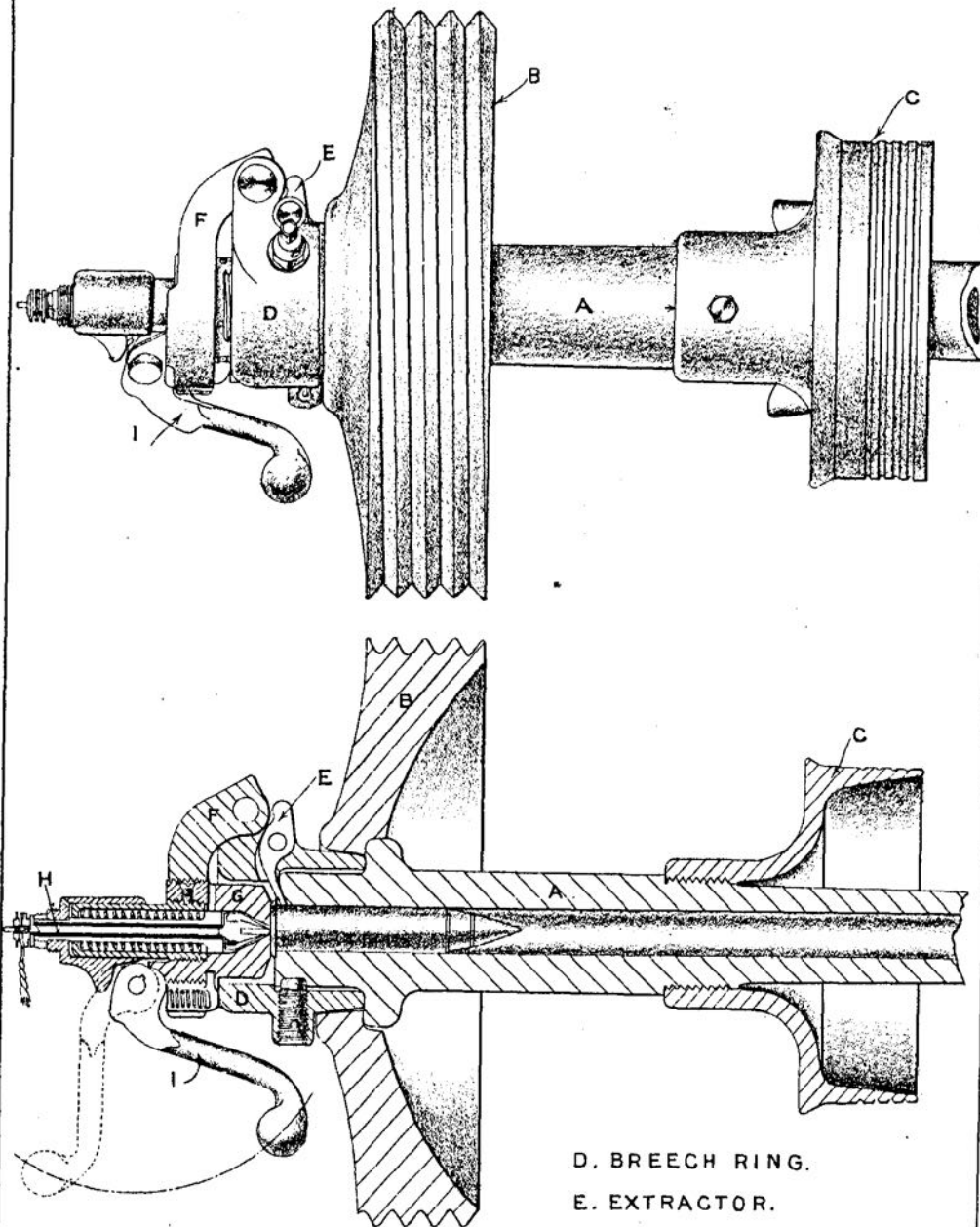
SCALE  $\frac{1}{4}$





RIFLE, AIMING, 1 INCH ELSWICK "B", Q.F. 6 INCH  
"B" GUNS, MARK I.

SCALE =  $\frac{1}{4}$ .



A. BARREL 1 INCH.  
B. REAR ADJUSTING FRAME.  
C. FRONT " "

D. BREECH RING.  
E. EXTRACTOR.  
F. CARRIER.  
G. BREECH SCREW.  
H. NEEDLE.  
I. CAM LEVER.



The 1-inch barrel is rifled and chambered on the Henry system, there being 11 grooves  $31\frac{1}{2}$  inches long with a uniform twist of 1 turn in 35 inches. A movable bronze collar having a taper corresponding to that of the chamber of the 6-inch Q.F. gun, is screwed over the exterior of the barrel, and in conjunction with a steel disc screwed to the breech end, serves to retain the barrel in position when it is in the gun. A recess is formed at the breech end of the barrel for the reception of the "extractor, cartridge."

The cartridge is detonated by means of the firing mechanism of the gun.

The aiming rifle is withdrawn from the gun by means of a tube extractor, which is passed through a hole prepared in the upper side of the steel disc for the purpose.

The .23-inch "C" aiming tube is of special pattern; it is furnished with brass collars which fit the larger tube, and it is secured by a nut and washer at the muzzle end.

#### RIFLE, AIMING, 1-INCH, ELSWICK "B," (MARK I).

(Plate V.)

This apparatus, which is arranged for electric firing only contains, its own firing mechanism (the breech mechanism of the gun is not used with it).

The principal parts of the rifle are as follows:—

- (a) Barrel.
- (b) Breech ring, with set screw and keep pin, safety stop and extractor.
- (c) Carrier, with hinge pin, and catch retaining breech screw.
- (d) Breech screw, with cam lever, case and set screw.
- (e) Sleeve withdrawing striker.
- (f) Striker, consisting of needle, insulating bush, and washers sheath, and mainspring.
- (g) Frame adjusting, front, with set screw.
- (h) Frame adjusting, rear.\*
 

{	Mark I with interrupted screw thread, and two handles. Mark II with continuous screw thread, and two handles. Mark III with continuous screw thread, and three handles.
---	---

#### DESCRIPTION.

The 1-inch barrel is chambered and rifled on the Henry principle. It is prepared on the exterior at the rear, with interrupted thrust collars for the reception of the breech ring; the latter, which is prepared for the reception of the breech screw, is secured in position on the barrel by means of a set screw and keep pin, and is provided with lugs for the attachment of the breech mechanism of the aiming rifle. It is also fitted with a safety stop to prevent the breech being closed until the breech ring has been locked in position on the barrel. An extractor, which engages with the head of the cartridge in the rifle, is pivoted in the breech ring in such a manner, that when the breech is opened and the carrier swung into the loading position, the cartridge is automatically released.

---

\* Either of these marks may be on charge.

The breech is closed by a parallel screw having two interruptions corresponding with the interior of the rear portion of the breech ring and is supported, when withdrawn, by a carrier hinged to the breech ring. The screw is attached to the carrier by screw threads on the rear end, which engage with corresponding screw threads in the carrier, and is worked by means of a cam lever.

Fitted to the outer face of the breech screw is a case enclosing a main spring through the centre of which the striker passes. The striker is provided with an insulated needle, one end of which projects through the firing hole in the breech screw, and makes contact with the primer of the cartridge. The outer end of the needle is provided with two nuts for the reception of the expendable cable from the firing battery.

To prevent the rifle being fired before the screw is locked, and cam lever lowered, a withdrawing sleeve is fitted over a portion of the spring case, and attached to the rear end of the striker. A projection on one side of the sleeve engages with the cam portion of the lever in such a manner, that the first movement of the lever, in opening the breech, automatically withdraws the striker within the face of the breech screw. The striker is automatically released when the screw is turned into the locked position, and the cam lever folded forward.

#### METHOD OF FITTING AND USING THE APPARATUS.

The front adjusting frame is screwed over the barrel until the lines on the front of frame and the right side of barrel coincide, and secured by means of the set screw.

The barrel with frame should then be placed in the breech opening of the gun, the part of the frame marked "TOP" being uppermost, the frame fitting in the rear end of the chamber of the gun. The Mark I rear adjusting frame is then placed over the rear end of the barrel, the part marked "TOP" being placed uppermost, pushed into the breech opening as far as it will go, and turned so as to engage with the screw threads of the breech opening. The frame should be jammed tightly into position in the breech of the gun, by means of the tommy, applied in one of the hollow handles, on the frame, and used as a lever. When correctly assembled the upper handle should be in the "vertical plane."

In the event of the rear adjusting frame screwing beyond the position mentioned above, thin steel discs are provided, to be inserted over the rear end of the barrel, as may be necessary, the frame being temporarily removed for this purpose; and in order to prevent the liability of the frame to unscrew when firing, a filling piece of hard wood is fitted to one of the interruptions in the breech opening of the gun after the rear adjusting frame has been inserted (one of the handles may have to be removed before the filling piece can be inserted).

When either Marks II or III rear adjusting frames are supplied, the method of fitting is as follows:—The barrel and front adjusting frame are inserted as before, the Mark II or III frame is placed over the end of the barrel, the part marked "UP" being uppermost, and turned so as to engage with the screw threads of the breech opening. The frame should be screwed tightly home by means of the tommy applied in one of the hollow handles on the frame and used as a lever.

Engraved upon the rear face of the frame is an indicator ring with the words "UP," "START TURNING AND SCREW HOME"; the indicator ring is flush with the rear face of the gun when in position.

The thin steel adjusting discs used with Mark I frame are not necessary when using either Marks II or III frames.

The breech ring with carrier and breech screw in the open position will then be placed over the rear end of the barrel, and revolved one-fourth of a turn, in such a direction as will admit of the inner end of the set screw in the breech ring engaging with the recess in the barrel for its reception and the keep pin inserted. Indicator lines are engraved on the breech ring with instructions to facilitate assembling.

Care must be taken when removing the breech ring from the barrel to see that the breech screw and carrier of the rifle are always in the open position, and the extractor, clear of the recess for its reception in the barrel.

Elevation is obtained by means of the carriage sights, and any error in line can be corrected by using the deflection scale.

The following separate demandable stores are supplied for use with this rifle:—

*Gauge Striker Protrusion, No. 3.*—Is used for gauging the protrusion of striker of the rifle aiming Elswick "B." *Instructions for using the gauge are laid down in "Regulations for Magazines and Care of War Matériel."*

*Extractor, hand.*—Is used to remove the empty cartridge case after it has been released by the extractor in opening the breech.

*Tommy.*—This is a cylindrical steel rod about 17 inches long, tapered at one end, which is inserted in one of the hollow handles of the rear adjusting frame, to give additional leverage in revolving it.

*Wrench, aiming rifle, No. 9.*—Is used for removing the striker case, small screws, and keep pins.

*Wrench, aiming rifle, No. 10.*—Is used for adjusting frames and all nuts.

*Rifles, aiming, 1-inch—*

<i>Brush, cleaning</i>	} Used for cleaning the 1-inch barrel.
<i>Rod, cleaning</i>	

When the aiming rifle is used in guns mounted on carriages which are fitted with automatic sights, and to give increased practice in laying with these sights, the ordinary cam of the automatic sights will be substituted by a cam cut to the range limit of the aiming rifle.

#### CARE AND PRESERVATION.

All actions and parts of the rifles and tubes should be kept perfectly clean and oiled, so as to keep them in good working order and prevent rust. No cutting material, such as emery cloth, is to be used for cleaning.

GUNS, SUB-CALIBRE, Q.F. 3-PR. MARKS I, I<sup>a</sup> AND III.

(Plate VI.)

Where especially authorised Q.F. 3-Pr. sub-calibre guns are supplied for use with Q.F. 6-inch "B" guns.

Q.F. 3-Pr. Hotchkiss guns are converted for this purpose and are designated "Guns, sub-calibre, Q.F. 3-Pr., Mark I." The conversion consists in the removal of the trunnions and the substitution of a screwed steel collar by means of which the sub-calibre gun is retained in position in the bore of the Q.F. 6-inch "B" gun.

The principal parts of the sub-calibre guns and separate stores are as follows :—

Guns, sub-calibre Q.F. 3-Pr.—

Q.F. 6-inch and 6-inch "B"  
guns, Mark I.

converted Hotchkiss; steel with  
component breech fittings, and  
block catch retaining with bolt,  
handle and keep pin.

Mark I.—

Counterweight, Q.F. 6-inch  
and 6-inch "B" guns

steel, with securing bolt.

(†) Frame, adjusting, front,  
Q.F. 6-inch and 6-inch  
"B" guns. Mark I.

steel, with set screw.

The front adjusting frame is secured round the muzzle of the sub-calibre gun, and serves to prevent injury to the bore of the Q.F. 6-inch "B" guns during insertion or removal.

The sub-calibre gun is secured in position in the Q.F. 6-inch "B" guns by the "Block, retaining catch" which is placed in the upper plain section of the breech opening.

The steel counterweight is secured round the chase of the Q.F. 6-inch "B" gun when the sub-calibre gun is used, to balance breech preponderance.

The ordinary breech mechanism of the Hotchkiss Q.F. 3-pr. gun is used, for which see the Handbook of that gun.

Instructions for assembling and removing the sub-calibre gun are detailed on page 19.

In future conversion to sub-calibre guns, Q.F. 3-Pr. Hotchkiss guns will be designated Mark III, and will differ from Mark I in being furnished at the rear end of the shrunk collar with a clamping nut and stop screw. The clamping nut will be so arranged that when screwed home into the breech opening of the Q.F. 6-inch "B" guns, the sub-calibre gun will be secured in a central position in the bore by tightening the clamping nut against the breech face of the Q.F. 6-inch "B" guns.

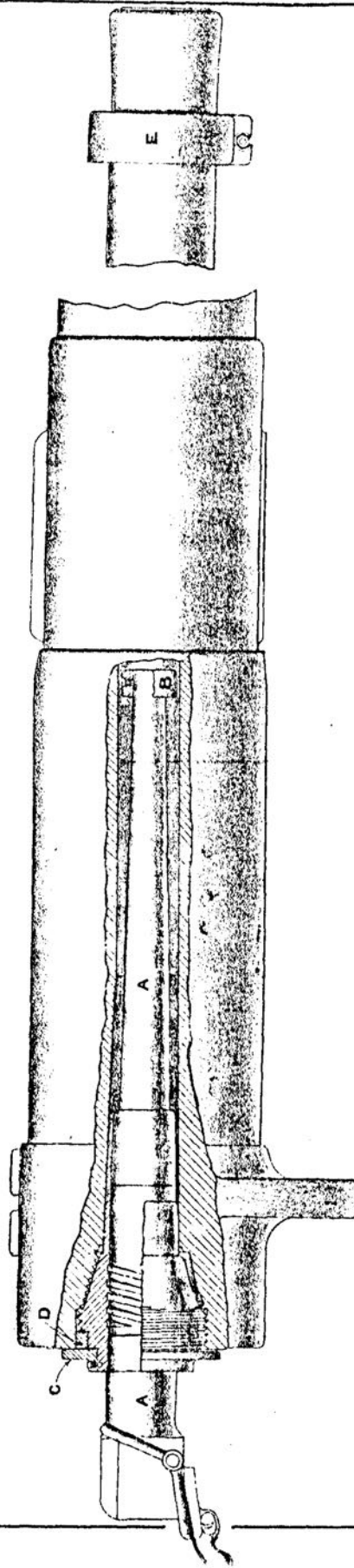
A special counterweight to balance breech preponderance is required with Mark III sub-calibre guns.

Existing Q.F. 3-Pr. sub-calibre guns when modified by the addition of the clamping nut, will have a star (°) added to the original mark of the gun.

† Future manufacture Mark III, bronze, lightened, with set screw.

GUNS, SUB-CALIBRE. Q. F. 3 PR. Q. F. 6 INCH "B" GUNS

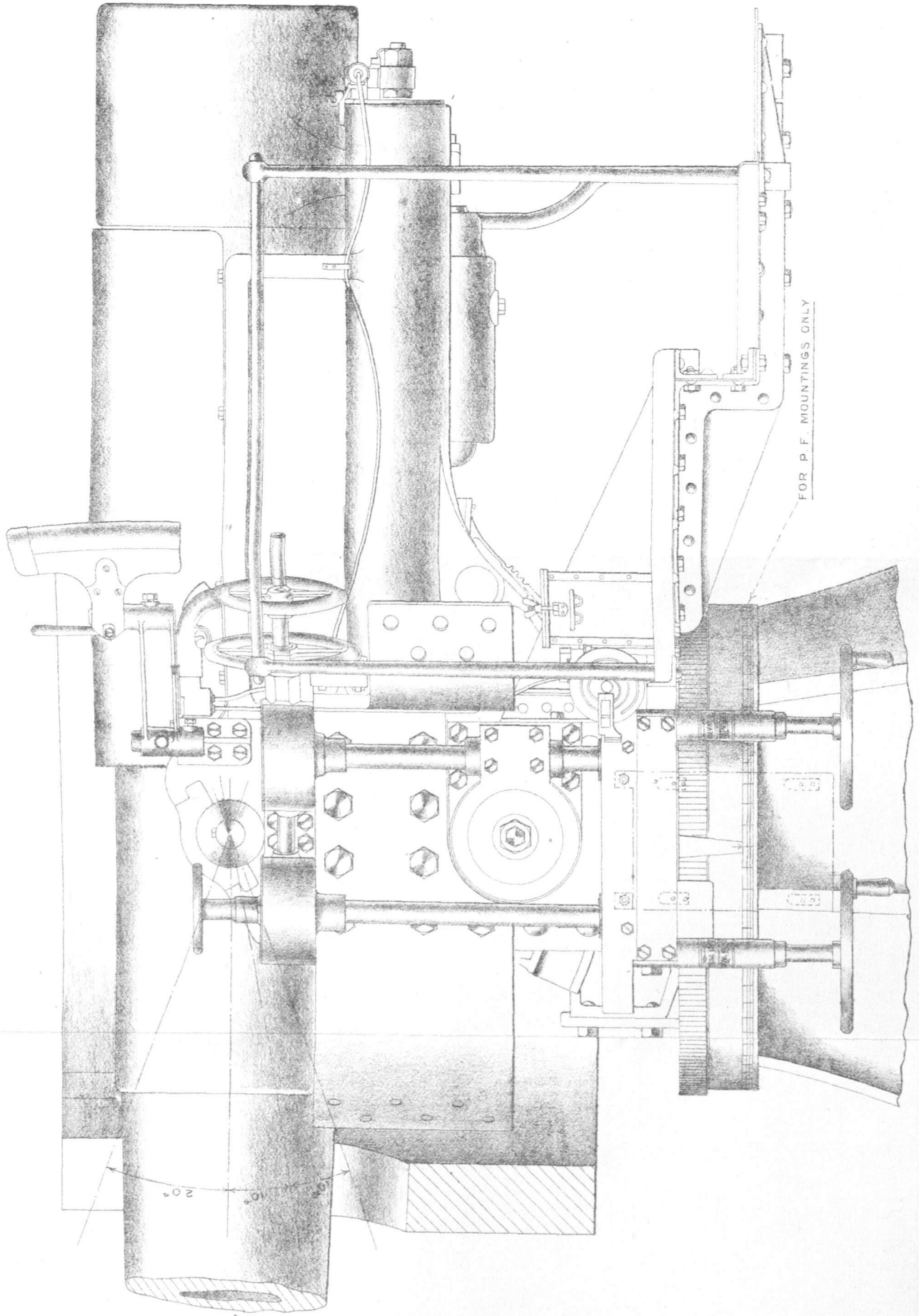
— SCALE  $\frac{1}{16}$  —



- A. SUB-CALIBRE GUN.
- B. FRONT ADJUSTING FRAME.
- C. CLAMPING NUT.
- D. BLOCK, SECURING.
- E. COUNTERWEIGHT.

CARRIAGE, GARRISON, Q. I. & II, MARK II.

SCALE  $\frac{1}{12}$   
(SIGHTS REMOVED)



ELEVATION



## INSTRUCTIONS FOR ASSEMBLING AND REMOVING SUB-CALIBRE GUNS.

Before inserting the sub-calibre gun, lay the Q.F. 6-inch "B" gun horizontal and remove the breech mechanism.

Remove the breech mechanism from the sub-calibre gun and insert the gun as follows:—

(1) Lift the gun by means of two handspikes one placed under the chase in front of the screwed collar, and manned by two numbers (one on either side), and one placed in the breech end of the bore and manned by two numbers.

(2) Insert the gun into the breech opening of the Q.F. 6-inch "B" gun until the screwed collar engages with the threads.

(3) Screw the gun into position by means of a handspike inserted through the mortice for breech block, until the rear face of the screwed collar is flush with the breech face of Q.F. 6-inch "B" gun in the case of Mark I sub-calibre guns, or until the front face of the clamping nut will engage the breech face of the Q.F. 6-inch "B" gun, when tightened up in the case of Marks I<sup>a</sup> and III sub-calibre guns, and the mortice for breech block is in the vertical position.

(4) Place the "Block, retaining catch" in the upper recess of the breech opening of the Q.F. 6-inch "B" gun, and turn the handle in the case of the Mark I sub-calibre guns. In the case of Marks I<sup>a</sup> and III sub-calibre guns, place the securing block in position through the hole in the clamping nut and tighten the latter against the breech face by means of the "Wrench, clamping nut."

Replace the breech mechanism of the sub-calibre gun.

The order of removal of sub-calibre guns will be the reverse of the foregoing.

## CARRIAGES, GARRISON, Q.F. 6-INCH.

## MARK II CARRIAGE.

The *Mark II carriage* (Plate VII) is constructed to allow of 20° elevation and 10° depression with the shield, and 20° without, and to revolve about a central pivot on a series of anti-friction balls. The pivot is contained in the pedestal, which is secured to the emplacement by the holdfast. The gun recoils in a cradle, which is fitted with an hydraulic buffer to limit the recoil to about 12 inches, and with springs to return the gun to the firing position.

The carriage consists of the following principal parts:—cradle with hydraulic buffer and running out springs, under carriage, pivot, sighting platform, traversing, elevating, and elevation indicator gears.

The *cradle body* is a U-shaped steel casting formed to fit the jacket of the gun, and having trunnions to pivot it to the under carriage. Three cylindrical chambers are formed on the underside, a central one for the hydraulic buffer cylinder, and one on each side for the running out springs.

A semi-circular steel band is provided to retain the gun in the cradle body; it is formed with lugs which fit in grooves in the cradle immediately above the trunnions, and is secured by screws; a screw hole, with a gunmetal plug, is formed in the top for the insertion of a No. 2 lifting eye, and two lubricating holes are

provided. A metal lined groove is formed in the cradle body and in the band for the guides on the gun jacket. Both the cradle body and jacket are fitted with brass liners to take the bearing of the gun.

A plane for the clinometer is cut on the left hand side, and a sheet steel cover is provided to protect the outer surface of the gun. A vertical projection on each side, just above the trunnions, is specially prepared for the attachment of the sight brackets.

#### HYDRAULIC BUFFER.

(Plate VIII.)

The hydraulic buffer consists principally of a cylinder with stuffing box and gland, a combined piston and rod, valve key and controlling plunger.

*The cylinder* is closed at the rear end by a stuffing box and gland, the former having an L leather packing ring secured by a gun metal ring, and an annular space for the greased packing which is compressed by the gland.

A passage is provided for the exit of air from the cylinder when filling; also a drain hole for emptying the cylinder, each being closed by a screwed plug.

*The Mark II piston* head and rod are in one forging of nickel steel, the head is fitted with a bronze bearing ring and formed with a port to suit the valve key; a cylindrical chamber is formed in the centre of the rod for the controlling plunger, the rear end of the chamber is fitted with a bronze bush which accurately fits the plunger when the gun is in the firing position; 3 radial holes are drilled in the rod adjacent to the head to convey the liquid to and from the plunger chamber; the removal of a screw plug at the rear end of the rod allows of the expulsion of air from the plunger chamber. Two nuts secure the rod to the lug on the breech of the gun, the larger one at the rear is secured by a keep pin, and the other by a set screw.

*Mark I piston* is made of inferior steel to that of Mark II, has a different pattern bush in the plunger chamber, and has no air hole or plug, and no radial hole through the rod into the plunger chamber.

The pistons and control plungers of existing carriages will, when the pistons are found to have expanded to 4.01 inches (and above) be replaced locally by the Mark II patterns, but the old spare pistons must be used up. Mark I controlling plungers must always be used with Mark I pistons.

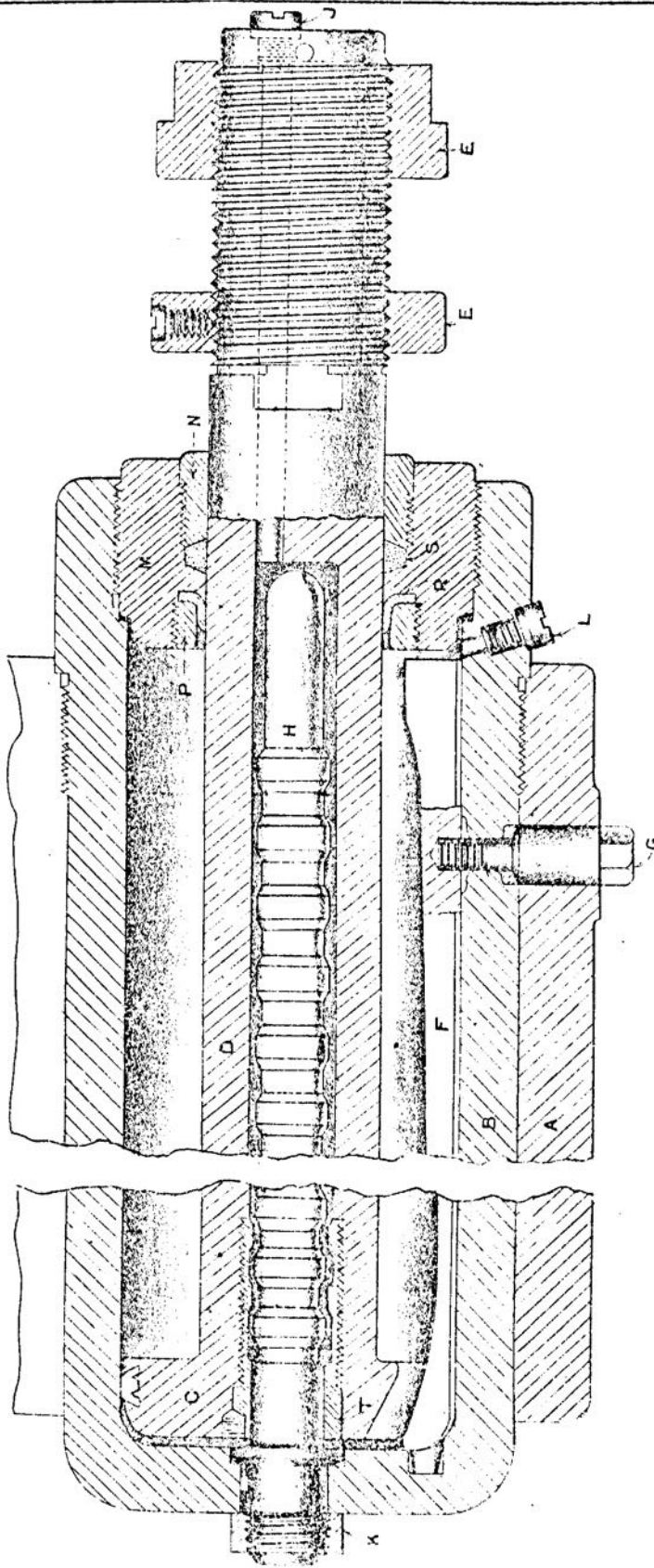
*The valve key* is of bronze and is secured by a screw to the lower surface of the cylinder; it is formed to fit the sides of the piston port, but varies in thickness and thus regulates the flow of the liquid from one side of the piston to the other during recoil and running up.

*Mark II controlling plunger* is of steel, and is secured centrally to the front end of the cylinder by a nut so as to enter the chamber in the piston rod. It is formed with a number of annular grooves and with a flat surface lengthwise, gradually diminishing toward the front end, which reduces the space for the escape of the liquid from the plunger chamber as the gun runs up.



# GENERAL ARRANGEMENT OF BUFFER WITH MARK II PISTON AND PLUNGER.

SCALE = 1/4



A. CRADLE  
B. CYLINDER  
C. PISTON  
D. " ROD

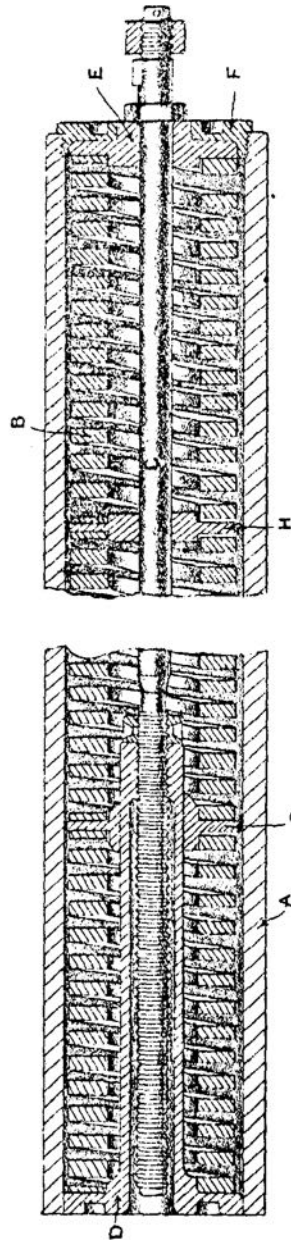
E. NUTS SECURING PISTON  
F. VALVE KEY  
G. SECURING SCREW  
H. CONTROLLING PLUNGER

J. PLUG  
K. SECURING NUT  
L. EMPTYING PLUG  
M. STUFFING BOX

N. GLAND  
P. RING SECURING L. LEATHER  
R. L. LEATHER  
S. PACKING  
T. BUSH

# GENERAL ARRANGEMENT OF RUNNING OUT SPRINGS.

— SCALE =  $\frac{1}{8}$  —



- A. CRADLE.
- B. SPRINGS.
- C. RUNNING OUT ROD.
- D. COMPRESSOR NUT.
- E. END PLATE.
- F. COVER.
- G. DIVIDING BUSH, FRONT.
- H. " " REAR.

*The Mark I plunger* is shorter than the Mark II, and is tapered at the rear end. A small hole is drilled centrally throughout its length and another meeting it radially. A plug is screwed into the rear end of the centre hole, having a tapered flat cut on its front end which controls the escape, from the plunger chamber, of the liquid as it passes through the radial and central holes of the plunger.

A *tank* is formed on the right hand side of the cradle above the hydraulic buffer. It contains a reserve of liquid to replace leakage, and is connected to the buffer cylinder by a suitable passage. The cylinder and tank are filled through a small opening in the top of the tank. The tank is closed by a circular cover which bears the instructions for filling. In certain carriages, the hole connecting the tank with the cylinder enters the tank above its lower surface, this defect has been remedied by the addition of a packing plate secured to the bottom of the tank by a screw.

*Running out springs.* (Plate IX).—These consist of two sets, each set being self-contained. A set comprises 3 springs separated by dividing bushes, and mounted on a compressor rod and nut. The rod is screwed for a considerable portion of its length, and engages with the nut, which is a flanged tubular casting of gunmetal. The springs are compressed between the flanges of the nut and an end plate which bears against a screwed ring in the spring chamber. The end of each rod is secured to a cross bar which is fixed to a projection on the rear end of the gun by screws.

#### ACTION OF BUFFER AND SPRINGS.

When the gun recoils on firing, it draws the piston and spring rods with it to the rear; the liquid in the cylinder, in passing from the rear of the piston to its opposite side, is forced through the space between the port in the piston and the valve key, which, owing to its shape, gradually closes the opening and brings the gun to rest. Meanwhile, the plunger chamber in the piston has become filled with liquid, and the running out springs have been further compressed, their subsequent expansion causes the gun to return to the firing position, and in doing so the plunger displaces the liquid in the piston, the space for its escape is gradually reduced by the tapering of the flat on the plunger, which results in the gun being gently brought to rest in the firing position. With the Mark I plunger, the liquid escapes through its centre and connecting radial holes to the cylinder; the size of the small flat on the plug determines the cushioning effect.

#### UNDER CARRIAGE.

The under carriage consists of a cast steel socket, with side plates which are formed at the top with trunnion bearings to support the cradle.

The socket is formed to fit over the upper end of the pivot, and is provided with gun metal bushes. The weight of the carriage and gun is supported on a series of anti-friction balls contained in a circular groove formed in the top of the pivot, and a bearing plate fixed to the top of the socket. The balls are arranged to roll between

two hardened steel rings; one in the socket and one in the pivot; the rings were originally fixed in position by a small portion of the pivot and bearing plate being spun over the outside face of the rings, but in future, and when existing rings require replacement, they will be fitted into recesses without being secured, and holes (with preserving screws) will be drilled in the bearing plate, and plain holes in the pivot to facilitate the removal of the rings. A small cover plate is secured by screws to the top of the bearing plate to protect the lifting hole in the upper end of the pivot.

On the left hand side plate, gunmetal brackets are bolted, for carrying the elevating and traversing gears; the upper brackets are formed as boxes with covers for enclosing the gears, and the lower one is provided with a cover for a similar purpose. Two gunmetal brackets are fixed on the right side plate for supporting an alternative quick traversing gear.

On the top rear side of the left side plate is fixed a bracket carrying a stud on which the shoulderpiece pivots, and a socket for pistol grip connector; the shoulderpiece being fixed in the required position by a clamping screw.

The sighting platform is bolted to the rear of the side plates; it is provided with handrails on each side, with an opening to the rear, and is reached from a structure in the emplacement. The "Carrier, battery box, No. 1," is secured to the upper side of the platform.

The pivot is of steel, tapered at each end; the longer and lower end is contained and supported within the pedestal, and the upper end fits into the socket of the undercarriage; the upper end is fitted with a steel ball racer, and a hole for a lifting screw as before described.

Under carriages are now manufactured with a flat surface on the front of the pivot socket for the attachment of a bracket with a clip, to engage under the projection on the traversing rack, in cases where 10 degrees depression or more are required from the mounting.

Carriages on which the flat bearing surface has not been cast, and where 10 degrees depression or more are required, have a special clip bracket and clip.

#### ELEVATING GEAR.

The elevating gear is actuated by means of handwheels on the left hand side (which can be worked either from the sighting platform or emplacement), and spur and bevel gears, which transmit motion through worm-wheel gearing to the elevating arc, on the underside of the cradle.

Plates on top of socket and underside of cradle form a stop for elevation at 20 degrees; the stop for depression being formed by the chase of the gun and the shield at 10 degrees.

#### TRAVERSING GEAR.

Traversing is effected by a worm-wheel gear actuated by a hand-wheel from the left side above the sighting platform, and by spur gearing actuated by a hand-wheel, worked from the emplacement, the mounting being revolved by a pinion, gearing with a circular traversing arc, fixed to the top of the pedestal. An alternative

quick-motion traversing gear consisting of a spur pinion and wheel gear, is actuated from the sighting platform by a hand-wheel, on the right side of carriage; this gear actuates a similar pinion to that of the worm-wheel gear, and engages with the same arc. The difference of speed for one revolution of the handwheel is about 5.33 to 1. When it is desired to work either the gear from the emplacement or quick-motion gear, the worm-wheel (on left side of carriage) is thrown out of action by releasing a clamping arrangement contained in the hollow of a worm-wheel; this arrangement consists of a series of steel and metal discs, which are pressed together or released by turning a small handwheel, which is at the front of the carriage on the left hand side.

Carriages served by a P.F. are fitted with pointers to indicate the angle of traverse.

#### ELEVATION INDICATOR GEAR.

The elevation indicator gear is used to indicate the angle of elevation in yards, when not using the sights, for giving elevation. It is intended to be used when operating the elevating gear from the emplacement. It is actuated by the oscillating movement of the cradle in the trunnion bearings as the gun is elevated or depressed. It consists principally of a bronzed toothed arc fixed to the underside of the cradle and gearing with a pinion on a cross shaft. To the left hand end of the shaft is fixed a disc with a detachable yard scale plate.

The face of the plate is formed with a spiral groove. A slide for carrying a reader is fixed to the left hand shaft bracket. The slide extends across the face of the scale plate, and is formed with a groove radial to the scale plate, to hold a reader having an indicating arrow. The reader has a projection which fits into the spiral groove in the scale plate, and moves backwards and forwards in the slide as the plate is turned. A spiral spring, to obviate errors due to backlash, is provided, having one end of it attached to the shaft, and the other end to a gunmetal case at the right hand end of the shaft.

Yard scale plates are provided for use with the full charge and 3 Pr. sub-calibre gun.

When securing a yard scale plate to the disc, the arrow of the reader must point to a red zero line on the plate when the gun is horizontal.

#### CELLULOID SCALES FOR YARD SCALE PLATES.

Celluloid scales will be provided for full charges, and sub-calibre guns, when regraduation is necessary, and for 1-inch aiming rifle practice.

The scales will be made, and the celluloid obtained, locally.

#### *Instructions for Fitting.*

To cut the spiral groove in the celluloid disc:—After having first obtained an impression of the existing groove in the plate, yard-scale, by means of paint or other suitable marking material available, drill a number of small holes where the groove is to be cut,

then blend the holes together with a small round file, care being taken to leave the groove a little narrow to required finished size.

To secure celluloid disc to existing plate, yard-scale :—Thoroughly clean the face of both the plate and celluloid disc with emery cloth (care being taken that they are free from grease), then warm the plate sufficiently to thoroughly melt ordinary shellac, giving the surface a very thin coating. When cold, give the surfaces to be stuck together a coat of liquid shellac (*i.e.*, shellac dissolved in spirit of wine). When tacky, place the celluloid disc in correct position to suit groove, then carefully weight with something having a flat surface. The disc should be further secured by small countersunk head screws on each spiral of the plate.

To complete :—Cut the groove in disc to full width of existing groove in plate. Pack up the arm carrying the reader with the equivalent thickness of celluloid disc.

#### SIGHTS AND SIGHTING GEAR.

(Plate X.)

The carriage is provided with a rocking bar sight on the right hand side, and an automatic sight and gear on the left hand side.

*The rocking bar sight* consists principally of a sight bar, rocking bar and carrier, the whole being secured to a bracket which is fixed to the top of the cradle.

The sight bar is of steel tubing, pivoted vertically to the rocking bar so as to admit of horizontal movement for deflection; the front end is fitted with an acorn pointed foresight having a protecting cap, and the rear end with two holders and hinged caps for securing a telescope; the front holder is fitted with a V-notched leaf for use as a hind sight.

The rocking bar is pivoted horizontally to the carrier so that the rear may be raised or lowered according to the range; the pivot for the sight bar is formed at the front end; to the underside of the rear end is attached a toothed arc, having for its centre the pivot of the rocking bar and carrier; the rear end is formed with a crosshead having a deflection screw with milled heads, the screw works in a nut which moves the sight bar to the right or to the left. The amount of deflection is indicated by a scale plate on the rocking bar and an arrow head. The space between each of the markings is equal to 10 minutes deflection. The total deflection is 2 degrees right or left.

The carrier is of steel and secured by eccentric bushes and nuts to the sight bracket on the cradle; the rocking bar is pivoted to the front end and to the rear end is secured a metal bracket containing a worm and worm-wheel gearing in each other; the worm is mounted on a spindle having an actuating handwheel at its rear end; to the spindle of the worm-wheel is fixed a pinion which gears into the teeth of the arc on the rocking bar, also a drum on which is mounted a detachable yard scale ring; the ring is secured to the drum by screws with nuts, the latter fit in a dovetailed groove formed round the drum.

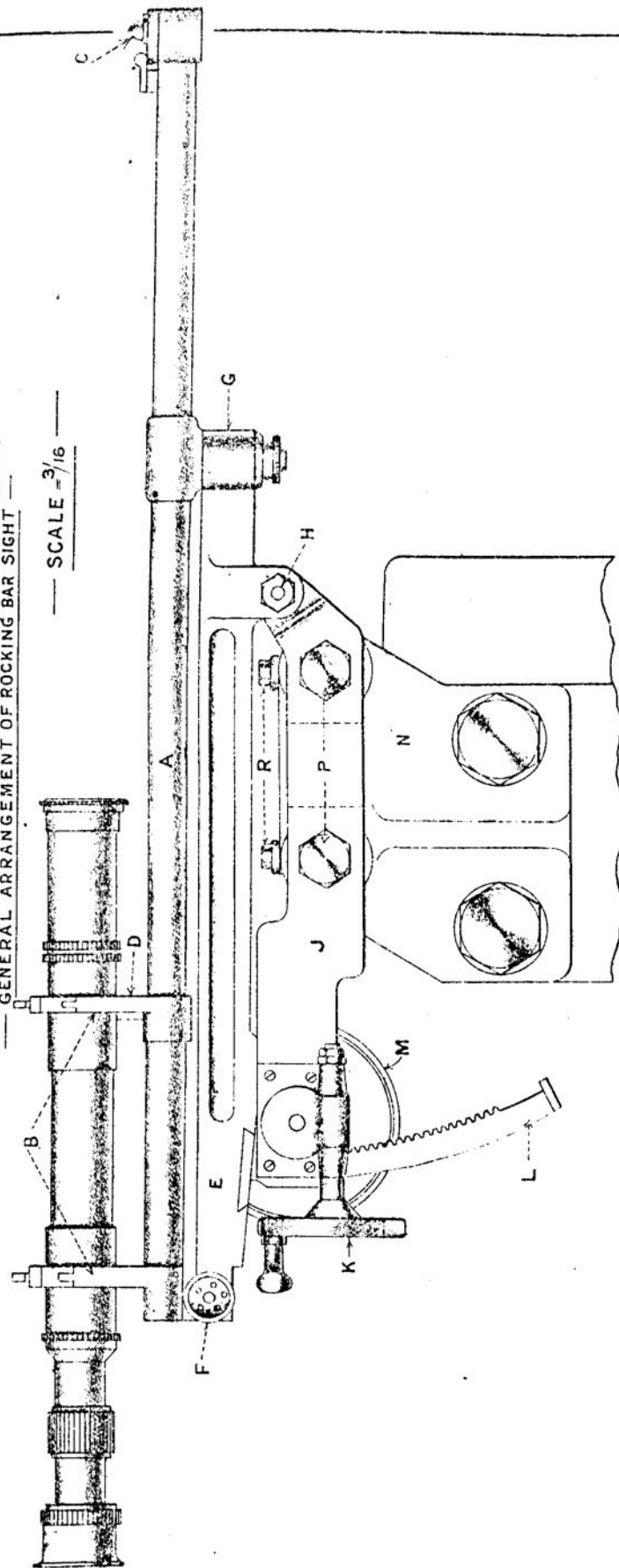
Yard scale rings are provided for the full charge, 3 Pr. sub-calibre gun, and 1-inch aiming rifle.



—CARRIAGE, GARRISON, Q. F. 6 INCH, MARK II.—

—GENERAL ARRANGEMENT OF ROCKING BAR SIGHT—

—SCALE  $\frac{3}{16}$ —



- |                      |                      |                                    |
|----------------------|----------------------|------------------------------------|
| A. SIGHT BAR         | F. DEFLECTION SCREW  | L. ARC                             |
| B. TELESCOPE HOLDERS | G. SIGHT BAR PIVOT   | M. YARD SCALE DRUM                 |
| C. FORE SIGHT        | H. ROCKING BAR PIVOT | N. SIGHT BRACKET                   |
| D. HIND SIGHT        | J. CARRIER           | P. SCREWS SECURING CARRIER         |
| E. ROCKING BAR       | K. HAND WHEEL        | R. SET SCREWS FOR ADJUSTING BUSHES |

The sight bar moves in a plane inclined at 1 degree 30 minutes to the vertical to compensate for drift due to rifling.

*The automatic sight and gear.*—Full description is given in the handbook of the automatic sight.

#### INSTRUCTIONS FOR CHANGING CAMS.

In changing cams the following instructions will be observed:—

- (1) To remove the spring case:—Remove the keep pin and collar from the axis stud on the sight bracket. Elevate the gun to compress the spring in its case, and pass a wire nail (or a piece of wire of suitable dimensions) through the hole in the outer case to retain the inner case. Depress the gun until the front end of the spring case falls clear of the stud on the cam roller lever, and remove the case from its axis stud.
- (2) To remove the cam, adjusting lever:—Unclamp the "stud, cam, adjusting lever," by the handle, and unscrew the two nuts on the end of the stud. Force the stud through the bracket toward the left, and remove the two nuts. Remove the cam adjusting lever.
- (3) Elevate the gun to about 15 degrees. Remove the cam hinge stud. Raise the cam and remove it outwards.
- (4) To mount the required cam with its adjusting lever, the order of the instructions detailed above is reversed. Care must be taken that the cam roller and the driving edge of the cam are quite clean.
- (5) Special adjusting levers are provided for sub-calibre guns and aiming rifles.
- (6) After changing a cam, adjust the sights as described in "*Regulations for Magazines and Care of War Matériel.*"

*For carriages not fitted with Correcting Gear, proceed as follows:—*

- (1) As in "(1)" above.
- (2) Remove nut and clip from adjusting lever.
- (3) Remove the nut and collar from the adjusting lever stud, and remove the adjusting lever. Remove the cam hinge screw together with the cam.
- (4), (5) and (6) As above.

#### ELECTRIC FIRING GEAR.

(See also "*Regulations for Magazines and Care of War Matériel.*")

The gear is arranged on the carriage so that the gun can be fired from either side of the platform.

The gear consists generally of a 4-cell electric battery, a battery box with connections, two pistol grip connectors, a pistol grip, safety plug box, sliding contact, and a series of cables.

The battery consists of 4 Leclanche cells of the agglomerate pattern ("Leclanche, A, Mark III,") contained within the battery box; the cells stand on strips of rubber, and are separated from



each other by a strip of felt; they are connected up in "series," being earthed by a copper strip at one end of the box. The box is made of galvanized steel plate, and is supported on the sighting platform.

Secured to the box is a "connection cable to battery box" from which the current is distributed by cables to the pistol grip connectors.

*The pistol grip connectors* are each similar in pattern, one is secured to the "bracket carrying shoulder piece" and the other to the upper traversing gear bracket on the right hand side. Each connector is formed with contacts for the pistol grip. The contacts are insulated and prepared for the reception of two cables, one from the battery box and one to the safety plug box. The pistol grip is secured in position by a set screw and jamming block, and a cover is provided to prevent the ingress of dirt, &c., into the recess for the pistol grip.

*The pistol grip, Mark III*, is used to test the tube and circuit immediately before firing, and for firing the tube. It consists principally of a casing, of an alloy of aluminium, with two contacts, indicator, contact lever, trigger, and a series of contacts and springs within the casing. The two contacts are formed to fit the contacts of the pistol grip connector. The indicator is contained within a separate detachable case, and is so constructed as to show alternately black and white sectors; a cover plate is provided which can be used to reflect the sectors in a convenient direction. The contact lever when depressed, completes the circuit through the indicator; the trigger being used for firing the tube.

*Action.*—(When a tube is in the gun, or the needle of the striker earthed) by gripping the handle the contact lever is depressed, the circuit through the indicator is completed and white sectors should be showing; by pulling the trigger, the indicator is cut out of the circuit and the tube fired.

*The safety plug box* is used as a junction box for the cables from the pistol grip connectors and sliding contact.

*The sliding contact boxes*, plate and plug, are attached to brackets, the former to the left hand rear end of the cradle, and the latter to the crossbar of the carriage; the platebox contains a rubbing plate, insulated and prepared for the attachment of a cable; the plug box contains an insulated spring plug having a suitable connection for the A cable. The contacts are so arranged that when the gun is in the firing position, contact is made, but immediately the gun leaves that position, contact is broken.

The components of the gear described above are connected up by a series of cables as described hereafter. Each cable, except "A," is provided with pin contact terminals, and gunmetal connecting screws to secure the cable in position; each connecting screw is stamped with a letter corresponding with a similar letter on the component to which it is attached. The cables, excepting A, are protected by wire braid covering. The A cable is expendable, its terminals are of stamped sheet brass shaped to suit the contacts on the gun and the sliding contact.

*List of Cables.*

Letter.	No.	Length.		Colour.	Distribution.	
		Mark II carriage.	Mark I carriage.		From.	To.
		ft. in.	ft. in.			
A	...	4 10½	4 10½	Un-coloured.	Gun.	Sliding contact.
B	{ 9	4 11	...	} Purple	Sliding contact plate.	Safety plug box.
	{ 6	...	3 0			
C	{ 3	7 10	...	} Red.	Right hand pistol grip connector.	Safety plug box.
	{ 5	...	9 6			
D	{ 3	7 1	...	} Yellow	Right hand pistol grip connector.	Battery.
	{ 4	...	8 0			
E	{ 3	0 11	...	} Black.	Left hand pistol grip connector.	Safety plug box.
	{ 5	...	2 0			
H	{ 3	3 3	...	} Un-coloured	Left hand pistol grip connector.	Battery.
	{ 6	...	2 6			

An additional "A" cable is provided for use with the 1-inch aiming rifle.

**RANGE DIALS (D.R.F.).**

Fittings are attached to the carriage for carrying a dial box "C" in either of the following positions.

(1) On the right hand side of the shield, for use in conjunction with the rocking bar sight.

(2). On the left hand side below the platform, for use in conjunction with the elevation indicator gear.

A terminal board is fixed to the platform, to the rear of the gun, so that the cables can be connected to it from the dial box in either position.

**SHIELD.**

The shield consists of a U-shaped steel plate tapered at each end. The front is cut away for the chase of the gun to admit of 10 degrees of depression, but may, when necessary, be cut away to allow of 20 degrees; the inside is also cut away to clear the sighting and elevating gears; it, however, will not be cut (to clear the sight bar) to give a greater angle of depression to the gun than the slope of the parapet will admit; to limit the depression when the gun is out of action, and prevent damage to the sights, a stop will be placed in the opening in the shield for the gun to bear against. This stop will be made and fitted locally as required. The shield is supported by curved stays bolted to the under carriage. There is a hole in the top edge, each side, for lifting eyes.

*Bridge, protecting sights.*—The shield is provided with a bridge of T-steel to protect the sights when putting on or taking off the carriage cover.

## PEDESTAL, CARRIAGE, No. 2.

*Mark II* pedestal is of cast iron, having in the direction of its axis strengthening webs; one of the webs is provided with a hole for lifting purposes. In later manufacture it will be fitted with screwed holes in the upper flange so that No. 2 lifting eye can be used when slinging the pedestal. It is formed at the lower end with a flange which is prepared for the holding down bolts of the levelling ring and holdfast, and at its centre for the reception of the pivot of the under carriage; the traversing rack is bolted down on the top edge; drain holes are provided; there are also three holes tapped for the levelling screws, which are of steel, with hardened points, and are intended to allow of the pedestal being raised for the insertion of packing as required, when necessary, to level the carriage for automatic sights.

*Mark I* is not so strong as *Mark II*. It is formed at the upper end to receive a supporting plate for the traversing rack.

## RING, LEVELLING, No. 2 CARRIAGE PEDESTAL.

The levelling ring is of cast iron, 4 inches thick, and is secured immediately under the pedestal.

*Levelling the pedestal.*—See “Regulations for Magazines and Care of War Matériel.”

## HOLDFAST, CARRIAGE PEDESTAL, No. 2.

The holdfast consists of seven anchoring plates and 28 holding down bolts; the bolts are bulb-headed with keys for recesses and keyways in the anchoring plates, and in the latest manufacture, a cotter is provided which passes through each bolt above the anchoring plates; six of the bolts have two nuts each, the others one, the six extra nuts being screwed down below the levelling ring so as to steady the holdfast while being embedded in the concrete to the level of the ring. The upper ends of the bolts pass through the levelling ring and the pedestal, the whole system being secured by nuts which are screwed on the bolts above the flange of the pedestal.

Weight of { Bolts, holding down, 15 cwt. 2 qrs. 20 lb.  
              { Plates, anchoring, 10 cwt. 3 qrs. 4 lb.

## ARC TRAVERSING, No. 37.

The arc is made of gunmetal, and is used on mountings served by a P.F. It is graduated in degrees which are sub-divided into  $\frac{1}{4}$  degrees and is secured to the top of the pedestal. The angle of traverse is indicated by a pointer on the carriage.

PARTICULARS OF Q.F. 6-INCH MARKS I AND II MOUNTINGS FOR  
LIFTING PURPOSES.

*Weight and Centre of Gravity of Main Portions.*

Name of main portion.	Mark I.		Mark II.		Vocab. No. of Lifting eyes where provided for.	No. of lifting eyes used.	Centre of Gravity.	Remarks.
	Average weight		Average weight.					
	cwt. qrs.		cwt. qrs.					
Cradle, with 2 presses running out, and hydraulic buffer ...	35	0	37	1	2	1	...	The centre of gravity is given for the under carriage stripped of all its gears and sighting platforms.
Under carriage, with fittings...	33	3	...	...	...	...	1½ inches in rear of centre line of trunnion.	
	...	...	38	1	...	...	65 inch in front of centre line of trunnion.	
Pivot ...	15	3	15	3	1	1	...	
Shield, without stays ...	72	0	84	0	2	2	...	
Pedestal, carriage, No. 2† (a) ...	129	0	129	0	2	2	...	
Ring, levelling, No. 2 carriage pedestal ...	25	0	25	0	...	...	...	
Holdfast, carriage pedestal, No. 2 ...	26	2	26	2	...	...	...	

† Where the pedestal is not prepared for lifting eyes in accordance with paragraph for L. of C. 11565, the holes in webs should be used for the purpose. (a) For weight of pedestal with lightening holes in webs deduct 4½ cwt.

COVER, CARRIAGE.

The cover is of waterproof canvas, and is for protecting the carriage. The Mark II cover differs from the Mark I in being made of three pieces so as to facilitate removing and replacing; it is secured in position by two 2ft. lengths of 1-inch tarred lashing, and straps with buckling pieces.

SPANNERS AND SPECIAL IMPLEMENTS.

Spanners—

- No. 48 for holding down bolts of carriage pedestal.
- „ 175 for adjusting automatic sight gear.
- „ 186 for spring compressor and cover for springs.

## Spanners--

- No. 187 for elevating pinion.
- „ 188 for “nut, plunger, controlling, running out.”
- „ 190 for sighting gear.

## Spanners, hydraulic buffer--

- No. 97 for stuffing box, piston rod, gland ring securing leather packing, and for piston rod nut.

## Screwdriver--

- No. 10 for small screws of automatic sight gear.
- „ 13 for air, filling, and drain plugs and screws of contact boxes.

## Eye, lifting--

- No. 1 for pivot.
- „ 2 for cradle shield and pedestal.

## Wrench--

- No. 6 for screws, band retaining gun in cradle, and preserving holes for lifting eye.

## APPARATUS, TESTING GUNLAYER.

The apparatus is used to facilitate the testing and instruction of gun layers with the automatic sight as laid down in G.A.T., Volume I.

It consists of a pointer and graduated scale plate. The pointer is pivoted to the centre of the elevation indicator gear shaft, and is clamped to the yard scale plate and disc by a spring and bolt attached to a clamping block. The scale plate is fixed to the shield and is formed with a loop at each end for the pointer; it is graduated in minutes and half-minutes and reads up to 20 minutes on one side of zero and 15 minutes on the other.

## APPARATUS, WITHDRAWING GUN FROM CRADLE, No. 3.

The apparatus is for drawing the gun a certain distance to the rear in the cradle (without the aid of a working party), for the examination, or repacking of the glands and stuffing box of the hydraulic buffer cylinder. If the stuffing box is to be removed, the gun must, during the operation, be slightly depressed and blocked up so as to prevent all possibility of its being elevated above the horizontal.

It consists of a clip, bracket and screw. The clip is placed over the lug on the rear end of the left spring case; the bracket is secured to the “crossbar, connecting springs,” and the screw connects the bracket and the clip. On turning the screw (the nuts of the rods running out springs first being removed), the gun, with piston rod and crossbar, is drawn toward the rear.

The gun may be withdrawn to a distance of about 18 inches if necessary.

The sliding contact fittings on the case and crossbar must be temporarily removed when using the apparatus, one of the screws of the contact fittings being used to secure the bracket of the apparatus in position.

### BAR, TESTING SIGHTING GEAR, AUTOMATIC AND ROCKING BAR.

The bar is for use in testing, by means of the service clinometer, the accuracy of the telescope holders on the automatic and rocking bar sights. It is formed to fit the telescope holders, and with a plane for the clinometer. An arrow head is engraved on the rear end, which will be set to correspond with a similar arrow head on the rear telescope holder.

When testing the angle between the gun and the sight, the clinometer readings will be taken from the bar fixed to the holders.

### HOLDERS—SIGHT CAM, SIGHT BAR, AND "BAR, TESTING SIGHT."

The holders are of wood, and are formed to protect the cams, sight bars and "bar, testing sights" when they are not in use on the carriage.

### BOX, SPARE PARTS AND SPRINGS.

The box is of wood, with hinged lid, and hook fastening. It is provided locally to hold spare springs, and such other small stores of the gun and mounting as it may be considered desirable to keep in it.

### TRAY, STORES.

The trays are for use in holding stores and spare parts for the service of the gun, and will be brought up to the gun when required for use.

### CARE AND PRESERVATION OF CARRIAGE, SIGHTS, &c.

(See also "*Regulations for Magazines and Care of War Matériel.*")

The circular grooves, containing the anti-friction balls, must be kept filled with mineral jelly to act as a lubricant, and to prevent the ingress of water. The grooves and balls must be perfectly clean and dry before inserting the jelly.

Shafts and spindles having nuts secured by taper pins will be marked to correspond with each other to prevent the nuts being placed on the wrong shafts or spindles. When necessary, nuts, shafts, or spindles will be marked locally with a letter or punch mark as most convenient.

Whenever any parts are found broken, defective or deficient, which cannot be renewed by the artificer, fresh parts should be demanded at once. Any damage occurring at drill or practice should be at once reported, with a view to its being made good without delay.

If any leakage of oil takes place at the gland, it should be tightened; if this will not stop the leak, the packing must be renewed.

*To replace packing of hydraulic buffer.*—To give sufficient space to work at the glands it may be necessary to disconnect the crossbar from the rods of the running-out springs and the gun from the hydraulic buffer, by removing the nuts; this will allow the gun to be run back, which should be done with care, with the apparatus described at page 30. Withdraw the piston rod a few inches, unscrew the gland, and remove the old packing. Clean out the stuffing box, slightly coat it and the piston rod with mineral jelly. Pack the stuffing box with new greased packing, which is  $\frac{1}{2}$ -inch

square in section; 36 inches will be required, which will be cut into lengths forming two rings, each about equalling the circumference of the piston rod; the cuts will be made diagonally, so as to overlap when the piece is formed into a ring. Well tallow each ring, press them successively into the stuffing box with a piece of wood, taking care that the joint of each ring is well separated from that of the other so as to break joint; screw home the gland, but not too tightly at first which would prevent free action of the piston rod. The bright parts should be coated with mineral jelly, and the gun connected up as previously.

*To replace leather washer or "L" leather.*—The gun must be disconnected and placed in a convenient position as before described. Empty the buffer by removing the plug of emptying hole and give air passage by releasing the filling hole plug on top of the tank. Unscrew stuffing box and move it to the rear to allow the leather washer to be taken out from the front, unscrew the metal ring and take out the L leather. The leathers are examined and, if unserviceable, removed; coat the new leather with dubbing; place the packing ring in position. Place the securing ring, L leather, and stuffing box on the piston rod, secure the L leather in the stuffing box by the securing ring and screw up the stuffing box. Connect up the gun as before and fill the buffer as hereafter described.

*To replace leather washer of tank cover, &c.*—Run off about 7 pints of oil as described for emptying the buffer, when the cover can be removed and the washer replaced; secure the cover to the tank and refill the buffer.

To replace leather washer on emptying hole plug the buffer will require emptying, but that of the filling hole can be replaced by simply removing the plug.

*Controlling plunger.*—In cases where it is found that the guns do not run up to the front stops, a flat surface will be filed on the Mark II controlling plunger, or screw plug of Mark I controlling plunger; if a flat surface is already formed it may be further adjusted if necessary. Too much metal must not be removed or the gun will run up to the stops with violence.

*To fill the buffer:*—

Carriages with Mark I piston and controlling plunger:—

Depress the gun, loosen the air plug and fill through the hole on top of the tank at the right side of the cradle until the oil overflows through the air hole; replace the air plug and fill the tank. Draw off half a pint, and replace the filling hole plug in the tank.

Carriages with Mark II piston† and controlling plunger:—

Depress the gun, loosen the air plugs in the cradle and rear end of the piston rod. Fill through the hole in the top of the tank at right side of the cradle until the oil overflows at the air hole in the piston rod. Replace air plug in the piston rod. Proceed with the filling until the oil overflows at air hole in the cradle. Replace air plug in the cradle and fill the tank. Draw off half a pint and replace the filling hole plug.

The liquid should be strained before entering the buffer.

Contents—about 10 quarts of mineral oil.

† Mark II piston can be readily identified by the rear end being fitted with a plug.



The greatest care must be taken of the projections above the trunnions and the sight brackets, as any indentations or disturbance of the surface will affect the accuracy of the sights.

#### TELESCOPE, SIGHTING, FOR ROCKING BAR AND AUTOMATIC SIGHTS.

The following telescopes can be used :—

No. 1, Marks I, I<sup>o</sup>, II and III.

No. 3, Marks I and II.

#### TELESCOPE, SIGHTING, No. 1.

##### *Particulars.*

Magnification	...	...	...	3 diameters.
Field of view	...	...	...	10 degrees.
Length over all	...	...	...	24 inches.
Weight	...	...	...	7 lbs.

*Mark I* telescope is of the ordinary erecting type, with an object glass and terrestrial eyepiece.

The body is fitted with two long gunmetal collars which accurately fit in the bearings on the sight bar, but allow three inches of movement backwards or forwards to suit the convenience of the gun layers.

The eyepiece is fitted with a fixed dermatine eyeguard.

A diaphragm carrying a diamond shaped pointer is fixed between the third and fourth lenses of the eyepiece.

The object glass is fitted in an eccentric cell and ring and is fixed in the correct position for infinite focus, or, in other words, for all objects over 400 yards distant. It is protected by a rayshade and metal cap.

*Mark I<sup>o</sup>* telescope differs from *Mark I* in having a detachable dermatine eyeguard.

*Mark II* telescope differs from *Mark I<sup>o</sup>* in having improved focussing arrangements. The turning movement of the eyepiece can be read off on an engraved ring, numbered 0 to 7 in conjunction with an arrow on the body, 4 being the position for normal vision, so that individual layers may set the focus to the figure previously determined.

The pointer is fixed at the focal length of the object glass.

*Mark III* telescope differs from *Mark II* in the diaphragm which carries the pointer, being made adjustable, so that collimation may be carried out by means of the diaphragms, instead of by rotating the object glass in eccentrics.

#### TELESCOPE, SIGHTING, No. 3.

##### *Particulars.*

Magnification	...	...	...	10 diameters.
Field of view	...	...	...	3½ degrees.
Length over all	...	...	...	24.5 inches.
Weight	...	...	...	7 lbs.

*Mark I* telescope is generally similar in construction to No. 1, *Mark II*, but differs in having a triangular shaped pointer.

*Mark II* telescope differs from *Mark I* in the diaphragm which carries the pointer being made adjustable by four screws, as in No. 1, *Mark III*.

*To focus the telescope.*—No. 1, Marks I and I<sup>a</sup>. Screw the eyepiece in or out until the pointer is clearly defined.

No. 1, Marks II and III, and No. 3, Marks I and II. Revolve the eyepiece tube by means of the knurled ring to the graduation required.

#### CARE OF TELESCOPE.

For care and preservation of telescope, sighting, see "Instructions" contained in telescope case, also "Regulations for Magazines and Care of War Matériel."

*Test for collimation.*—Lay the tip of the pointer on a well defined object some distance away, the further away the better, and turning the telescope completely round in its bearings, the tip of the pointer should remain on the distant object if correct for collimation.

#### MARK I CARRIAGE.

The *Mark I* carriage (*Plate XI*) is somewhat similar to the *Mark II*. It is constructed to allow of 20 degrees elevation and 10 degrees depression.

The sides and socket of the under carriage are formed in one casting of steel.

The elevating and traversing gears differ from those on the *Mark II* in their arrangement. The elevating arc is fixed to the left side of cradle, and there are no handwheels for traversing or elevating the gun from the emplacement.

Two sighting platforms are provided, one on either side.

Elevation indicator gear is not provided.

Cams or yard scale rings for sub-calibre guns are not provided.

A shield is fitted to the right side of the cradle to steady the gun layer.

For cables of electric firing gear see page 27.

Fittings for range dials are not provided.

The shield is only fitted to certain carriages.

The traversing arc (No. 36) is generally similar to that for the *Mark II* carriage, and is only used with mountings served by a P.F.

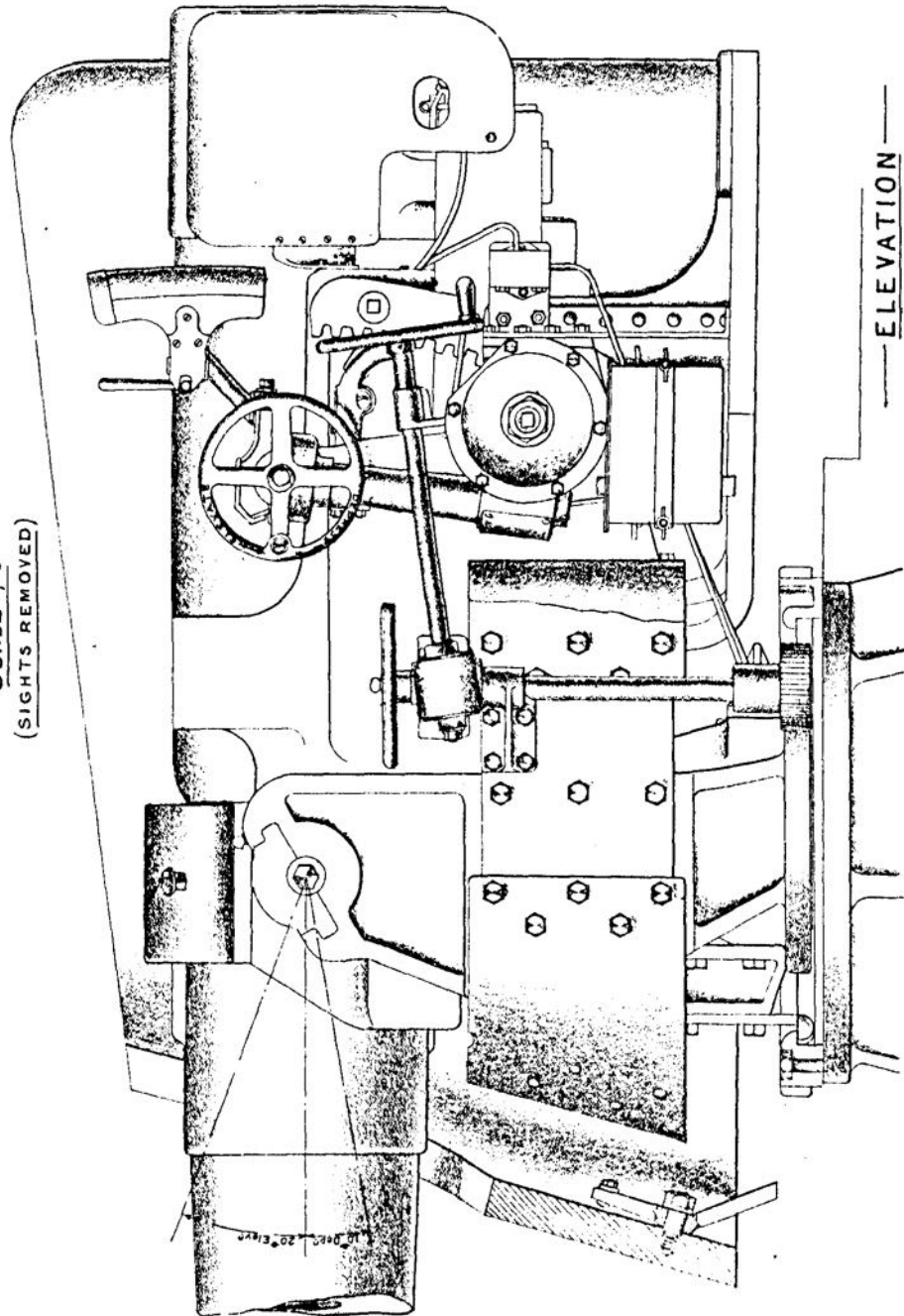
The spanners and special implements are the same as for the *Mark II* carriage, except that the No. 188 is also used for the depression stop, and the wrench No. 6 for the screws of the elevating arc.

For weights and centre of gravity see page 29.

Apparatus for testing the gun layer is not provided.

CARRIAGE, GARRISON, Q. F. 6 INCH, MARK I.

— SCALE =  $\frac{1}{16}$  —  
(SIGHTS REMOVED)



— ELEVATION —

GUN.

35

\* Issued only when specially ordered.

AMMUNITION FOR RIFLES, AIMING, 1-INCH.

Description.	Mark of Cartridge.	Weight of bullet.	Charge.	Means of Firing.
		ozs.      grs.		
Cartridge—				
Aiming rifle, 1 inch electric	..    ..    ..	9    408	400 grains R.F.G. <sup>2</sup> powder	Electric primer.
"    "    blank	..    ..    ..	..    ..	"    "    "	"    "    "

## CARTRIDGE, Q.F. OR Q.F.C. 6-INCH GUN, SHORT, 13 LB. 4 OZ. CORDITE

SIZE 30. WITH  $\begin{cases} \text{PRIMER.} \\ \text{ADAPTER.} \end{cases}$

(Plate XII.)

Mark VIII cartridge consists of Mark II<sup>oo</sup>, III<sup>o</sup> or IV case, with primer or adapter, cordite charge, igniter, cordite cylinder, glazed-board and felt discs, and Mark III or IV lid.

The charge consists of 13 lb. 4 ozs. cordite size 30, secured in the form of a bundle by shalloon braid in four places; the outer rings of cordite sticks divided and tied in eight equal bundles at the base of the charge to increase the diameter at the base.

The igniter consists of 1 oz. 4 drs. S.F.G.<sup>2</sup> gunpowder secured to cordite cylinder with silk sewing; the cordite cylinder fits in the centre of the charge at its rear end.

Above the charge are placed the glaze board disc and felt disc; these are held in position by the lid.

Attached to the top of the lid is a paper label showing on it the word "Cordite" also the size and lot number of cordite, weight (with the letters "A.C." if the weight of cordite has been adjusted) and numeral of the filled cartridge.

Mark VII cartridge differs principally from the Mark VIII in the cordite sticks being of different lengths and contained in a shalloon bag, the rear end is not separately bundled, and the igniter is of R.F.G.<sup>2</sup> new or converted powder.

Mark VI cartridge differs from Mark VII by having the cordite contained in a silk bag secured by silk twist.

The cartridges are packed four in a "Box, cartridge, Q.F. 6-inch Land Service."

CARTRIDGE, Q.F. 6-INCH GUN, LONG, 29 $\frac{3}{4}$  LBS. E.X.E. WITH  $\begin{cases} \text{PRIMER.} \\ \text{ADAPTER.} \end{cases}$ 

Mark I cartridge consists of a brass case, with primer or adapter, powder charge, felt wad and Mark III lid.

The charge consists of 29 $\frac{3}{4}$  lbs. of E.X.E. inserted in the cartridge in two portions; the first portion consists of 13 lbs. of powder placed in the lower part of the case in layers, the second portion consists of 16 $\frac{3}{4}$  lbs. of powder enclosed in a shalloon bag choked with sewing twist.

The igniter consists of 7 prisms of Prism<sup>1</sup> Black placed in the bottom and second layers.

Above the charge is placed a felt wad, this is held in position by the lid.

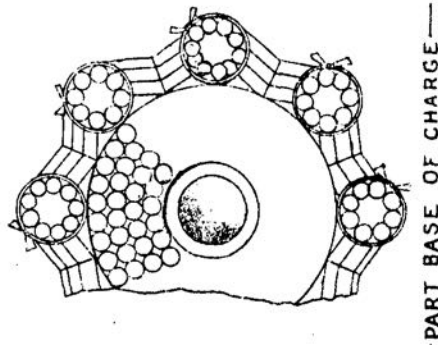
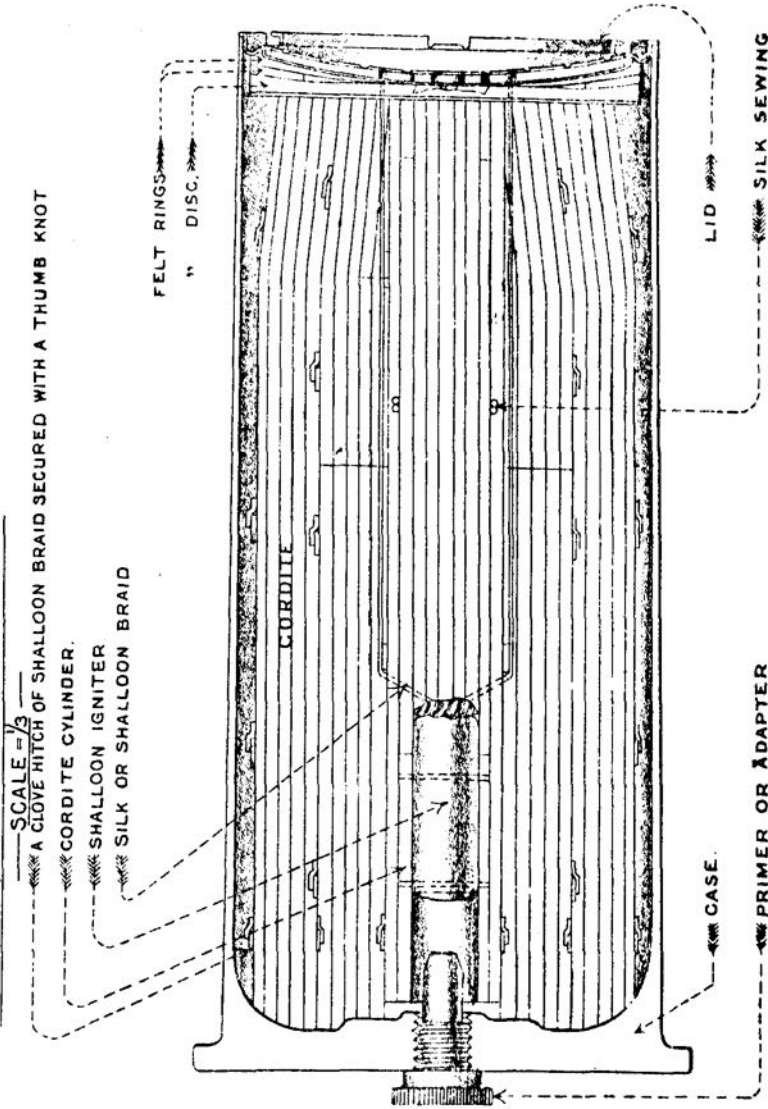
The cartridges are packed four in a "Box, cartridge, Q.F. 6-inch Land Service."

CARTRIDGE, Q.F. OR Q.F.C. BLANK, 6-INCH GUN, WITH  $\begin{cases} \text{PRIMER.} \\ \text{ADAPTER.} \end{cases}$ 

(Plate XIII.)

Mark V cartridge consists of a brass case, with primer or adapter powder charge, silk cloth bag, paper dome, igniter, asbestos cylinder, felt disc and Mark III or IV lid.

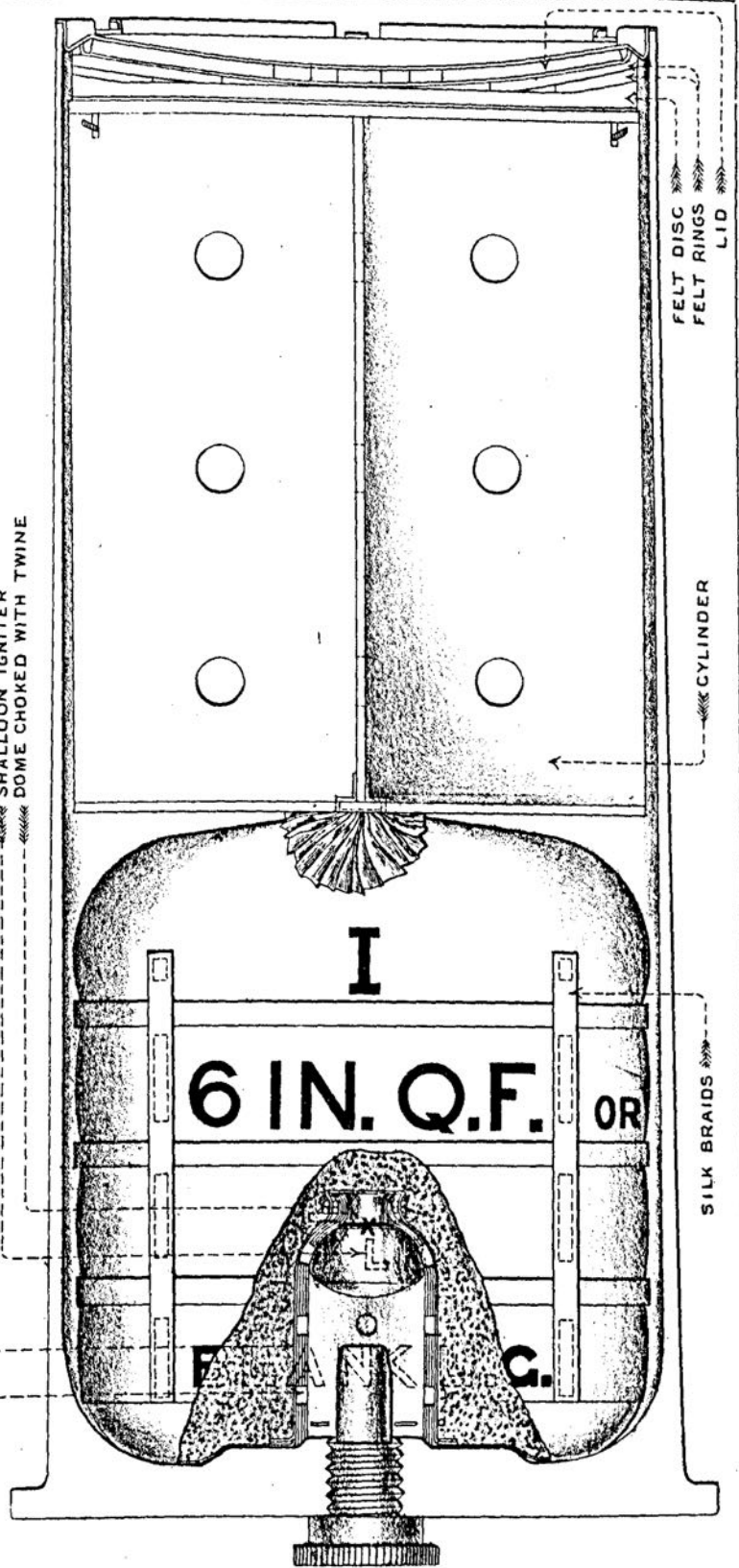
CARTRIDGE, Q. F. OR Q. F. C. 6 INCH, GUN, SHORT, FILLED, 13 LB. 4 OZ.  
CORDITE, SIZE 30, MARK VIII.



CARTRIDGE, Q. F. OR Q. F. C., BLANK, 6 INCH GUN, FILLED, MARK V.

SCALE  $\frac{1}{2}$

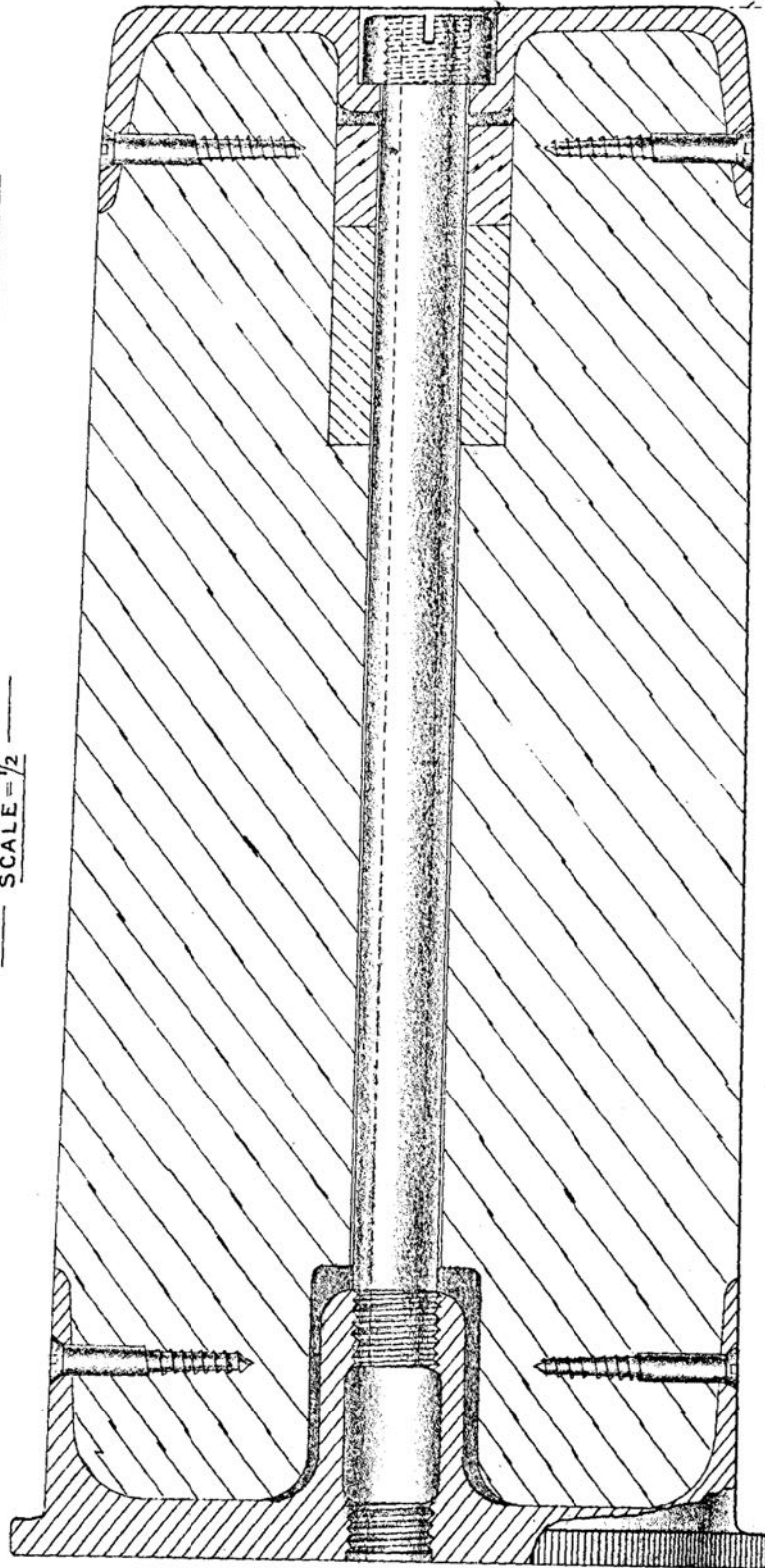
12 HOLES  
CALICO & WHITE WRAPPING PAPER DOME  
SHALLOON IGNITER  
DOME CHOKED WITH TWINE





CARTRIDGE, DRILL, Q. F. OR Q. F. C. 6 INCH, GUN, SHORT, MARK V.

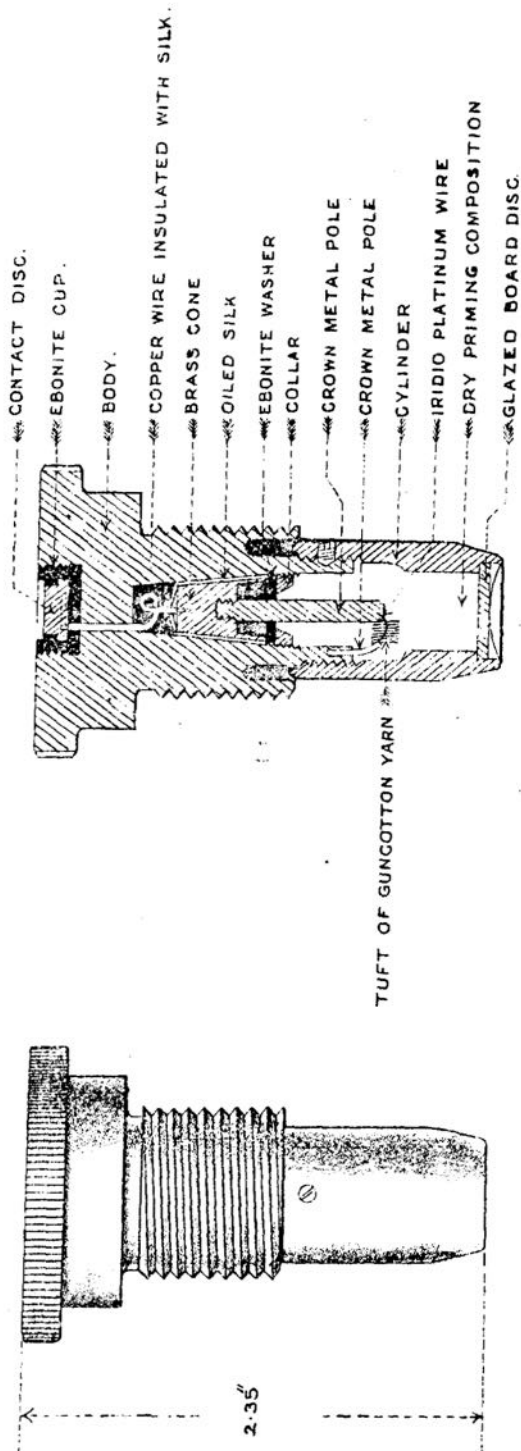
— SCALE =  $\frac{1}{2}$  —



15.9"

# CARTRIDGE, Q. F. OR Q. F. C. PRIMER, ELECTRIC, LARGE, MARK V.

— SCALE  $\frac{1}{16}$  —



The charge consists of 7 lbs. Blank L.G. contained in silk cloth bag.

The igniter consists of  $8\frac{1}{2}$  drs. R.F.G.<sup>2</sup> or new Blank F.G. powder contained in shalloon bag and secured in a paper dome in a recess at the base of the charge.

Above the charge is placed an asbestos cylinder and felt disc; these are held in position by the lid.

Mark IV cartridge differs from Mark V in the asbestos cylinder and lid being of different marks.

Mark III cartridge differs from Mark IV in having a paper instead of asbestos cylinder.

The cartridges are packed four in a "Box, cartridge, Q.F. 6-inch Land Service."

*NOTE.*—Empty cartridges must be cleaned immediately after firing, see "Regulations for Magazines and Care of War Matériel."

CARTRIDGE, DRILL, Q.F. OR Q.F.C. 6-INCH GUN, SHORT.  
(Plate XIV.)

Mark V drill carriage is made of teak with gunmetal ends to represent the service cartridge, the base being screwed to receive a dummy primer or adapter. A central tube runs through the cartridge from the primer hole to enable the electric testing of primers and tubes to be carried out, when necessary.

Mark IV drill cartridge differs principally from Mark V in the central tube and screws securing the gunmetal ends not being so strong.

Mark III drill cartridge differs from Mark IV in not having a central tube.

CARTRIDGE, Q.F. OR Q.F.C. PRIMER, ELECTRIC, LARGE.  
(Plate XV.)

Mark V primer electric consists of a body, ebonite insulator, contact disc, cone, copper wire connecting the disc and cone, two poles, iridio-platinum wire bridge, brass cylinder, ebonite washer, screwed collar, priming composition, and glaze-board disc.

The body is of manganese bronze, below the shoulder it is screwed to fit in the cartridge. The head has two slots cut in it to take the "Keys, inserting and removing primers." The end of the body is reduced in diameter and threaded to receive the brass cylinder.

The face of the body between the two screwed portions is cupped out to form a gascheck. The head is recessed to receive the insulator and contact disc.

The contact disc is of pure tin and the top is slightly below the surface of the body.

The cone is brass, cupped out in the base to form a gascheck and is insulated from the body by oiled silk. To the top of the cone an insulated copper wire is soldered, and the end passed through the hole to the contact disc.

The poles are of crown metal; one screwed into the base of the cone and kept central by an ebonite washer, which in turn is kept in place by a screwed collar. The other pole is fixed to the body, and the wire bridge joins the two poles.

The cylinder is brass screwed to fit over the end of the body and secured by a set screw. It is recessed at the tapered end to take a glaze-board disc.

A tuft of guncotton is wrapped completely round the bridge, and the interior of the body and cylinder is filled with priming composition.

The earlier marks of primer have been brought up as nearly as possible to Mark V pattern, from which they differ in minor details only.

Primers, electric large, will gradually become superseded by V.S. electric wireless, P tubes with adapters.

Spare primers are packed 10 in a cylinder, 20 cylinders in a wooden box.

#### CARTRIDGE, Q.F. OR Q.F.C. DRILL, PRIMER DUMMY.

Mark IV dummy primer is made of steel with a circular recess in the head, and is used for drill purposes, it is blackened and stamped "DUMMY" on the head. It is similar in external shape to the service electric primer except that it lacks the plain portion of the body.

Mark III is made of brass. A disc of hard rubber is secured in the head.

Surplus steel adapters may be used in lieu of dummy primers, the V.S. drill tube being used where the guns are provided with V.S. tubes and adapters.

#### CARTRIDGE, Q.F. OR Q.F.C. ADAPTERS.

(Plate XVI).

Mark IV adapter is made of aluminium or manganese bronze, with the interior shaped to take the ordinary V.S. tubes, and has a fire hole at the bottom. The small end is closed by a paper disc which is shellaced on and painted over with Pettman cement, to prevent the ingress of damp to the cartridge.

Mark II adapter differs principally from Mark IV in being made of steel and the small end is not closed to prevent the ingress of damp. It is screwed at the point and will be used with any cartridges for which Mark I igniter is used until the stock is used up.

Mark I adapter differs from Mark IV, in being made of hardened steel.

#### IMPLEMENTS, FUZE, SHELL AND CARTRIDGE.

Keys { Inserting adapter or electric primer.  
 Removing " " "

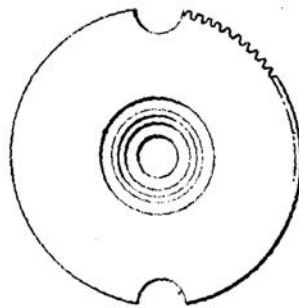
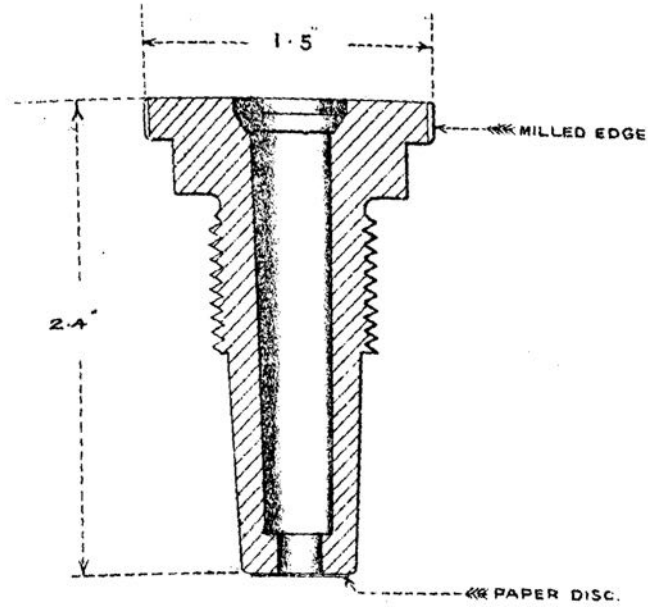
(Plate XVII).

These are made of mild steel to the form shown in the plate.

They are used for inserting and removing adapters in the cartridges. Mark IV "Key, removing adapter or primer" is self adjusting and suitable for removing all adapters either before or after firing.

# CARTRIDGE, Q.F. ADAPTER. MARK IV.

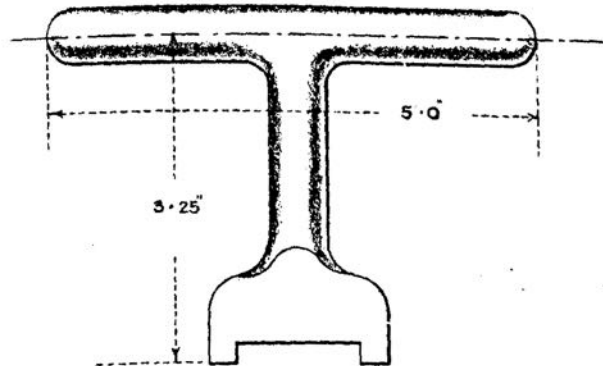
— SCALE =  $\frac{1}{1}$  —



IMPLEMENTS, FUZE SHELL AND CARTRIDGE.  
KEY, INSERTING ADAPTER OR ELECTRIC PRIMER.

MARK I

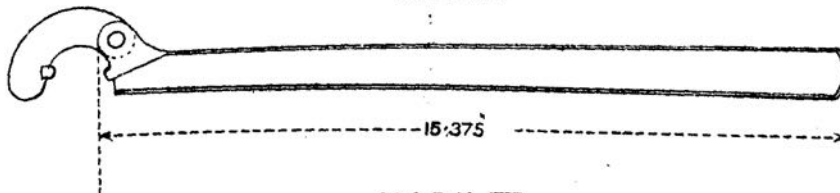
SCALE =  $\frac{1}{2}$



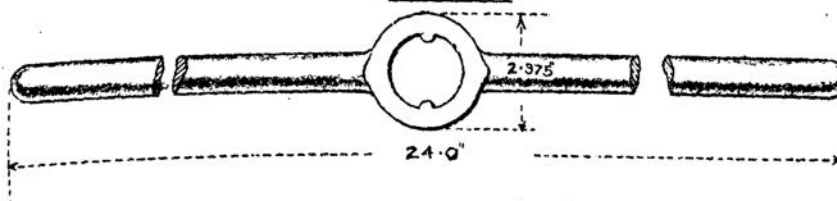
KEYS, REMOVING, ADAPTER OR ELECTRIC PRIMER.

SCALE =  $\frac{1}{4}$

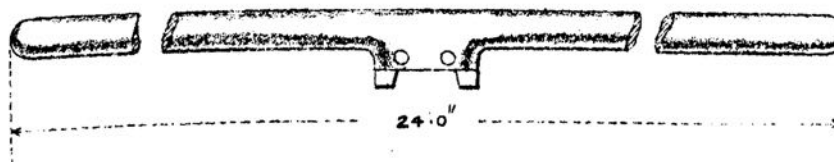
MARK IV



MARK III.



MARK II

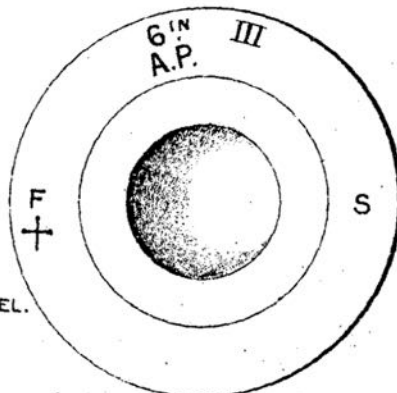
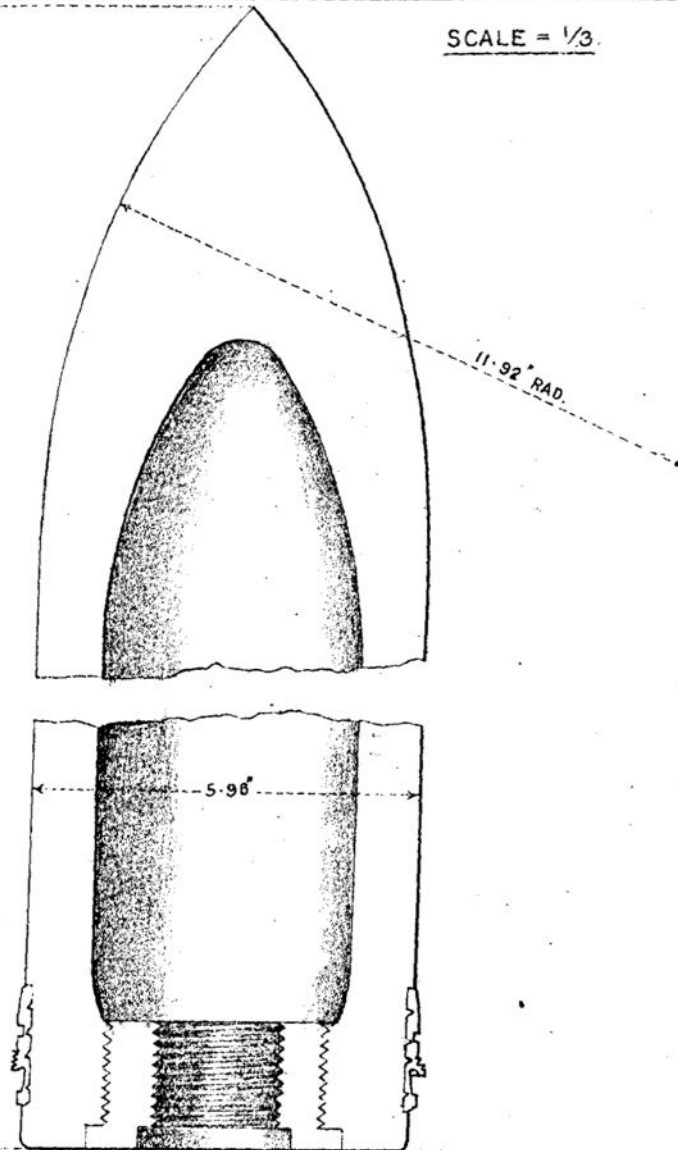


*Note: Mark I. differs from Mark II. only  
in the shape of the studs.*

SHELL, B.L.Q.F. OR Q.F.C. ARMOUR PIERCING, 6 INCH, GUN M<sup>K</sup>III.

SCALE =  $\frac{1}{3}$ .

LENGTH LEFT TO CONTRACTOR.



† OR 'C' IF OF CAST STEEL.

PLAN OF BASE.



## CARTRIDGE, AIMING RIFLE, 1-INCH ELECTRIC.

These cartridges are for use with the rifle, aiming, 1-in., Elswick, "B."

The Mark V M consists of a solid drawn brass case, with a hole in the base tapped to receive the primer. The charge consists of 400 grains of R.F.G.<sup>2</sup> powder.

The Mark I primer consists of a brass tube with an enlarged head threaded to screw into the case. The tube is bored out, the metal being thinned at the front end.

Fitting in the tube is a brass contact pin, which is insulated with ebonite plugs. An iridio-platinum wire bridge is soldered with pure tin to the point of the contact pin and front edge of the body, the bridge being surrounded with guncotton dust; the front end of the primer is closed with a card wad shellaced in. Two slots are cut in the head for the "key inserting and removing primer."

The bullet weighs about 9 oz. 408 grains; it has three cannelures round it filled with beeswax and the base is hollowed out.

The Mark IV M cartridge differs principally from the above in the primer which is pressed instead of being screwed in.

The Mark IV K N cartridge differs from Mark IV M in the primer only, which is of different dimensions and internal arrangements.

Packed 96 in a "Box, ammunition S.A.G.S." in bundles of 12.

## CARTRIDGE, AIMING RIFLE, 1-INCH ELECTRIC, BLANK, MARK I.

This cartridge consists of the service charge and Mark IV Morris pattern case and primer, the charge being covered by two asbestos discs, which are coated with Pettman cement on the top and edges.

The mouth of the case is turned in.

Packed 12 in a bundle, 8 bundles in a box.

## KEY, INSERTING AND REMOVING, PRIMER, CARTRIDGE, AIMING RIFLE, 1-INCH ELECTRIC, MARK I.

The key is of steel and is for use in inserting and removing the primer of the Mark V M electric cartridge.

## CARTRIDGE, AIMING TUBE C.F.

Mark II cartridge consists of a brass case with a cap chamber and anvil in the base; two fire holes in the anvil allow the flash to pass from the cap to the charge, which consists of  $3\frac{1}{4}$  grains of powder; the bullet is of lead.

Mark I differs in the arrangement of the wads and in the bullet having no recess in the base.

SHELL, B.L., Q.F. or Q.F.C. ARMOUR-PIERCING, 6-INCH.  
(Plate XVIII.)

Mark III shell is of forged or cast steel with a hardened pointed head, which is struck with a radius of two diameters. The total

length of the shell is left to the manufacturer. The base is closed with a steel bush screwed in and tapped to take the "Fuze, percussion, base, large, No. 11."

An undercut groove is turned in the body near the base, into which is pressed a copper gascheck driving band to impart rotation to the shell; four waved ribs are formed in the groove to prevent the band turning on the shell.

The driving band has one cannelure, and the front slope of the gascheck portion serrated or roughened to grip the bore when the shell is rammed home.

The inside of the shell is lacquered, and the bursting charge of 5lb. 8oz. P. and F.G. powder is contained in a dowlas bag. In shells filled since 1906 the bags burster are of lasting cloth, and any of the following powders may be used:—Blank L.G., R.L.G.<sup>4</sup>, L.G., R.L.G. or R.L.G.<sup>2</sup>

Mark II shell differs from the Mark III in having five straight instead of waved ribs in the groove for driving band; chisel cuts across the ribs prevent the band from turning.

#### SHELL, B.L., Q.F. or Q.F.C. LYDDITE, COMMON, 6-INCH.

##### *Plate XIX.*

Mark VIII shell is of forged steel with a solid base in which is screwed a steel plate disc; it has a tapered cavity and the head is struck with a radius of two diameters, the point being truncated and fitted with a gunmetal bush which is tapped to the G.S. fuze-hole gauge.

The driving-band is the same as that described for the Mark III Armour-Piercing shell.

The interior of the shell is varnished and nearly filled with lyddite.

Lyddite shell are painted yellow all over, and are issued filled, no preparation being required before loading them in the gun other than fuzeing.

Mark VI differs from Mark VIII in shape of the cavity.

Mark IV differs from Mark VI in not having a steel plate disc and in being slightly heavier.

Mark III shell differs from the Mark IV in having five straight instead of waved ribs.

Mark II differs from the Mark III in having thinner walls and consequently a larger bursting charge.

Mark I differs from the Mark II in the groove for driving-band not being undercut.

Marks I to III shells, which have been fitted in the base with a steel plate disc, will have a star added to the numeral. Mark IV will have two stars added.

For further details see "Treatise on Ammunition."

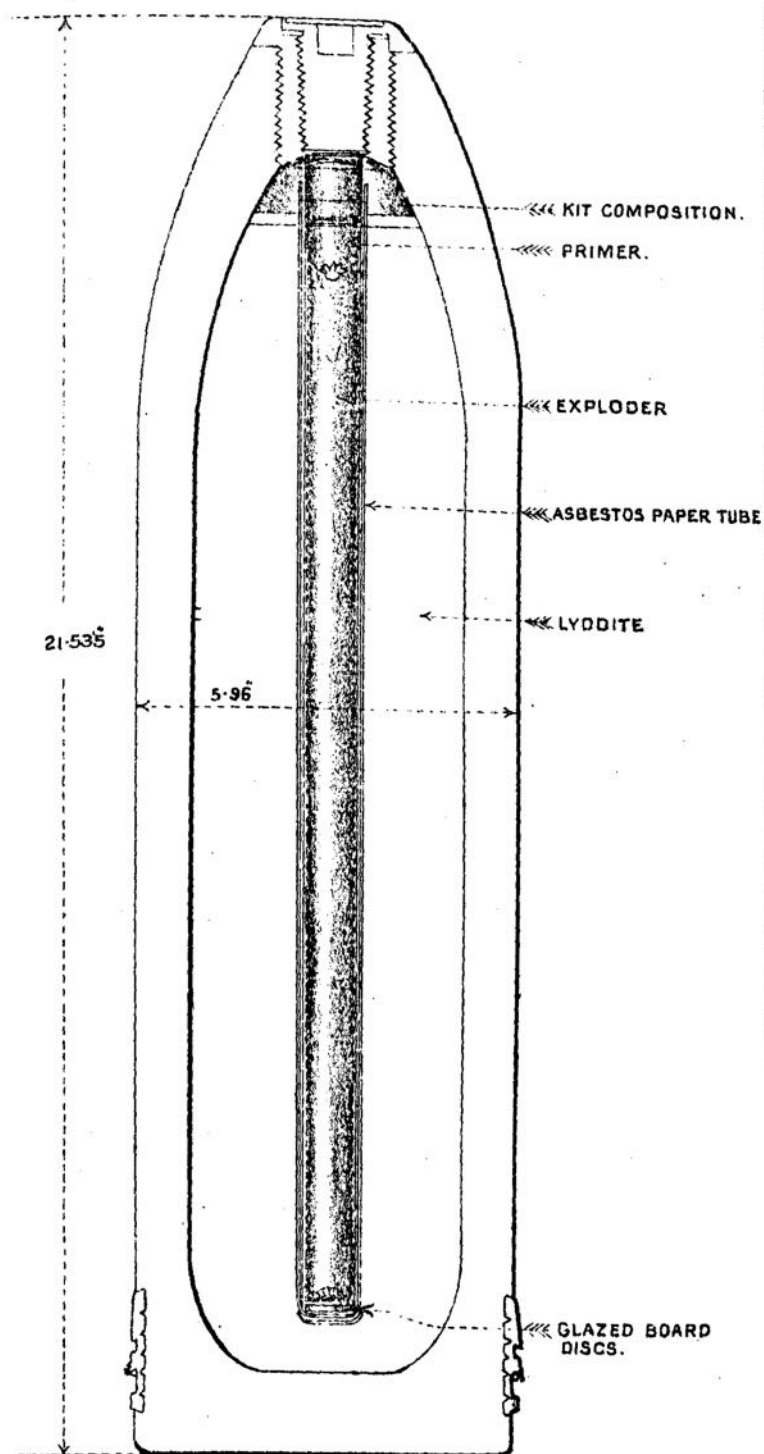
#### SHELL, B.L., Q.F. or Q.F.C. SHRAPNEL, 6-INCH.

##### *(Plate XX.)*

Mark IX shell consists of a steel body with a solid base and a steel head.

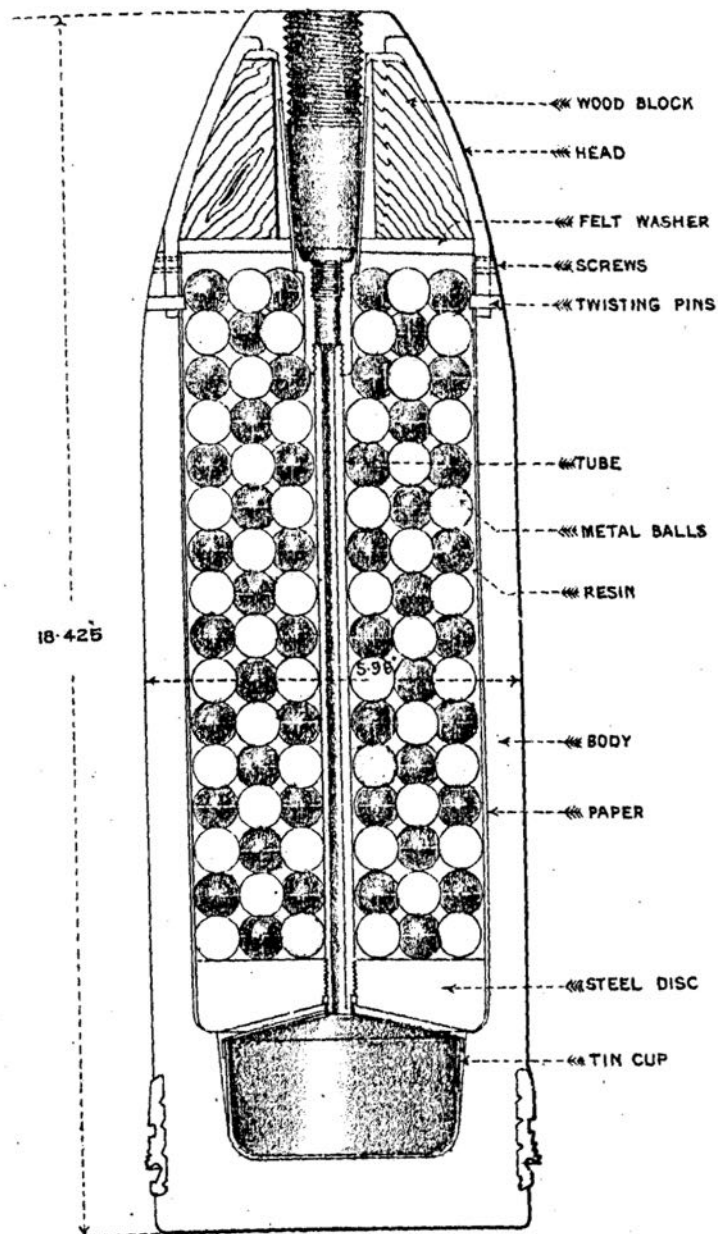
SHELL. B.L., Q.F., OR Q.F.C., COMMON LYDDITE, 6 INCH. M<sup>K</sup> II

— SCALE =  $\frac{1}{3}$  —



SHELL, B.L., Q.F. OR Q.F.C. SHRAPNEL, 6-INCH, CAST STEEL, MARK IX

SCALE =  $\frac{1}{3}$ .



The head, which is fitted with a metal fuze socket screwed to the G.S. gauge, is secured to the body by screws and twisting pins. The interior of the head is fitted with a wood block bored to take a tin socket, the top of which fits on the base of the fuze socket; a metal socket is soldered to the lower end of the tin socket to take a shrapnel primer.

The base of the interior of the body is recessed to take a tin cup containing a bursting charge of  $10\frac{1}{2}$  oz. of R.F.G.<sup>2</sup> powder.

The shell is lined with brown paper and contains about 453 balls (14 per lb.) supported by a steel disc placed over the tin cup.

A metal central tube, which is screwed into the primer socket at the upper end and into the steel disc at the lower, conveys the flash to the bursting charge.

An undercut groove is turned on the outside of the shell .77-inch from the base, and is fitted with a copper gascheck driving-band with one cannellure. The groove has four waved ribs to prevent the band from turning on the shell.

Mark VIII differs from the Mark IX in the groove for driving-band having five straight ribs, the latter having chisel cuts across them to prevent the band turning on the shell. When shells are rebanded, waved ribs will be formed in the groove and a star added to the numeral.

Mark VII differs from Mark VIII in having thinner walls (.55-inch) and in containing 518 balls (14 per lb.). It is also .5 inch longer (18.925-inches). When shells are rebanded, waved ribs will be formed in the groove and a star added to the numeral.

Mark VI differs from the Mark VII in the groove for driving-band not being undercut. When shells are rebanded the groove will be undercut and waved ribs formed, two stars being added to the numeral. Shells which have only had the groove undercut have one star added to the numeral.

Mark V differs from Mark VI in having a driving-band with the front slope slightly grooved and two undercut cannellures. Shells rebanded with the gascheck band described for the Mark IX have a star added to the numeral, but if the groove is also undercut and waved ribs formed, three stars are added to the numeral.

Mark IV has thinner walls (.5-inch), and 536 balls (14 per lb.), otherwise it is the same as Mark V. Shells rebanded with the gascheck band described for the Mark IX have a star added to the numeral, but if the groove is also undercut, and waved ribs formed, three stars are added to the numeral.

#### SHOT, PAPER, EMPTY, B.L., B.L.C. OR Q.F., 6-INCH, MARK IV.

Mark IV consists of a pressed wood pulp cylinder painted black, and having a filling hole in the base, closed with a bung. When required for use the shot is brought up to weight by filling with a proportion of small shot and sawdust. The previous marks differ principally in being made of brown paper or papier-mâché.

Paper shot are stencilled "Not to be fired with cordite." As they break up on firing, the small shot travel but a short distance (about 200 yards), while the effect, for purposes of testing recoil, &c., is practically the same as that obtained with the service projectile. They will therefore be issued for use in time of peace, where the use of the service projectile would be dangerous or inconvenient.

There will, no doubt, be emplacements from which, owing to the close vicinity of houses, it may be undesirable to use these shots in the normal line of fire. In these cases it will be often found possible, owing to the very short range of the paper shot, to find sufficient space to the right or left of the regular range to carry out such test practice as may be required.

SHOT, PRACTICE, B.L., Q.F. OR Q.F.C., 6-INCH.  
(Plate XXI.)

Mark I shot is made of cast iron with a pointed head struck with a radius of 2 diameters. The total length of the shot is left to the manufacturer. The driving-band is identical with that described for the Mark III Armour-Piercing shell.

The following projectiles are also used for practice purposes:—

SHELL, B.L., Q.F. OR Q.F.C., COMMON-POINTED 6-INCH.

These shell are made of cast steel.

A hole is bored in the base to take the "Fuze, percussion, base, large No. 11."

The bursting charge consists of 9lb. 4oz. P. and F.G. powder.

SHELL, B.L., Q.F., OR Q.F.C. COMMON, 6-INCH.

Marks III and IX are made of iron and have a bursting charge of 7lb. 4oz. P. and F.G.

Marks V and VI are made of cast steel and have a bursting charge of 8lb. 14oz. and 9lb. 13oz. P. and F.G. respectively.

The shells are truncated and fitted with a G.S. fuzehole socket to take the "Fuze, D.A. with cap No. 1" for guns on land fronts and "Fuze, D.A. with plug No. 3" for guns on sea fronts.

SHELL, B.L. OR Q.F. DRILL 6-INCH GUN.

Mark V drill shell is of cast iron, with two gunmetal bands to prevent injury to the rifling of the gun. The nose is bushed with a gunmetal socket tapped to G.S. gauge and the base fitted with a large hollowed and flanged gunmetal plug having a cross bar to which the No. 1 extractor may be hooked for extracting the shell from the gun.

A groove is turned between the gunmetal plug and the body of the shell which is filled with spun yarn wound round the shell to prevent the shell jamming in the gun.

Previous marks of drill shells have been altered to approximate to the Mark V, a star being added to the numerals.

AUGMENTING STRIPS.

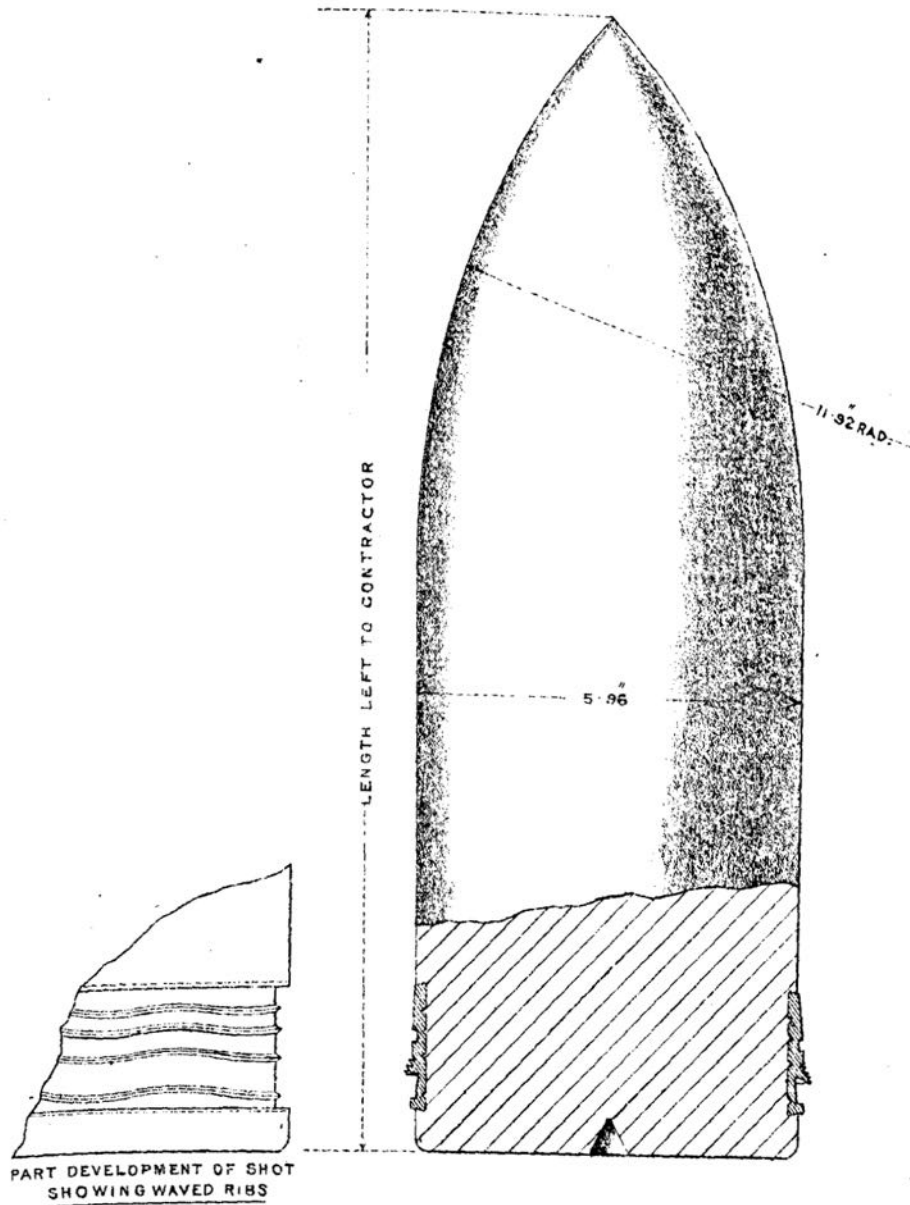
Projectiles not fitted with gascheck driving band may be fired with cordite charges at practice, provided that an augmenting strip is used.

The augmenting strip should be fitted in the rear cannellure of the driving band.

In the case of worn guns an additional augmenting strip will be fitted in the front cannellure when required.

SHOT, PRACTICE, B.L., Q.F. OR Q.F.C.  
6-INCH. GUN, MARK I.

SCALE =  $\frac{1}{3}$ .





# FUZE, PERCUSSION, BASE, LARGE, N° II, MARK V: METAL.

SCALE = 1/1.

SCREWED CAP.

SET SCREW.

COMPRESSED POWDER RING.

NEEDLE.

PHOSPHOR BRONZE SPRING.

DETONATOR.

DETONATOR PELLET.

CENTRIFUGAL BOLT.

CLOSING PLUG.

LOCKING PELLET.

BODY.

RETAINING BOLT FOR METAL PEA BALL.

METAL PEA BALL.

STEEL PROTECTING PLUG.

POWDER PELLETS.

3.4"

SMALL RETAINING BOLT.

PRESSURE PLATE.

The augmenting strips are of copper, of even section throughout and grooved on one side.

*Method of insertion.*—The cannellure in the driving band is to be undercut all round on both sides by means of a special chisel supplied for that purpose. (Cannelures are undercut in late manufacture and the driving band marked "U.") The augmenting strip is inserted in the cannellure, grooved side of the strip inwards and lightly hammered until the tongues, formed by the groove in the inner side of the strip, are dovetailed into the undercuts of the cannellure.

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For instructions respecting the preparation, &c., of projectiles, see "Regulations for Magazines and Care of War Matériel."

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#### FUSE, PERCUSSION, BASE, LARGE, No. 11.

This fuze is for use with common pointed and uncapped armour piercing shells.

Mark V (Plate XXII) consists of the following parts:—Metal body, detonator pellet, centrifugal bolt, copper pressure plate, perforated steel plug, locking pellet, small retaining bolt, retaining bolt for pea ball, pea ball, detonator plug, detonator, screwed cap with needle, phosphor-bronze spring, two brass springs, four screwed plugs for body, set screw, and screwed pin.

The body is turned and screwed on the exterior to suit the shell; the interior is bored out and screwed, the bottom of the bore being coned and recessed for the detonator pellet. A hole is bored through the side of the body to receive the small end of the centrifugal bolt, and closed by a screwed plug; a hole is also bored through the opposite side of the body to receive the small retaining bolt and closed by the screwed plug. A third hole is bored and screwed at an angle of 45° to the first hole, to receive the screwed pin for detonator pellet. Further holes are bored, one to receive the retaining bolt for pea ball, and two others longitudinally for the channel for powder pellets, and pressure plate; a hole is also bored from the powder pellet channel to the centre of the body. The top of the body has a circular recess for a compressed powder ring and two elongated holes are cut in the base of the body for screwing the fuze into the shell.

The interior of the detonator pellet is bored and screwed at the top to receive a detonator plug, and a flash hole is bored through. A hole is bored at right angles to the axis for the centrifugal bolt, and further holes for the brass pin of the centrifugal bolt and locking pellet. The exterior of the pellet at the top is recessed to form a seating for the spring, and the bottom is reduced in diameter, forming a cone and stem, to suit the body of the fuze. A slot in the pellet engaging with a pin screwed into the body of the fuze prevents the pellet turning.

The pressure plate is cupped, having a lip round the edge to form a gascheck. A portion of the stem is reduced in diameter to enter slot in the small retaining bolt.

The steel plug is perforated with four holes, and is secured in the recess in the base below the pressure plate by centre punch dabs. The underside is coated with rubber solution.

The detonator contains about three grains of composition.

The screwed cap has a curved top and the lower part reduced in diameter to suit the top of body. The bottom is reduced in diameter to accommodate the spring, and has a steel needle firmly embedded in, and projecting beyond it. Six holes are bored through the flange of cap and a hole bored and screwed for the set screw; the latter for fixing the cap.

The centrifugal bolt is fitted with a brass pin, which engages in a hole in the detonator pellet to prevent the bolt turning. A flash hole is bored through the stem of the bolt.

The small retaining bolt prevents any movement of the centrifugal bolt.

The pea ball seals the channel in the body containing the powder pellets, and is held in position by its retaining bolt.

Weight of fuze, 2lb. 10ozs.

The fuzes are issued, wrapped in brown paper, one in a tin cylinder.

*Action.*—On discharge, the pressure of the gas crushes in the pressure plate, causing the spindle to release the small retaining bolt, and consequently the centrifugal bolt; the rotation of the shell causes the latter bolt to spin out, leaving the detonator pellet free. On impact the detonator pellet moves forward on to the needle and is locked by the locking bolt; the flash from the detonator passes through the central channel of the pellet and hole in the centrifugal bolt and so to the channel containing the powder pellets, the pea ball retaining bolt and ball having previously spun out owing to the rotation of the shell. The powder pellets burn up through the body to the compressed body powder ring in the top when the flash passes through the holes in the cap and into the shell.

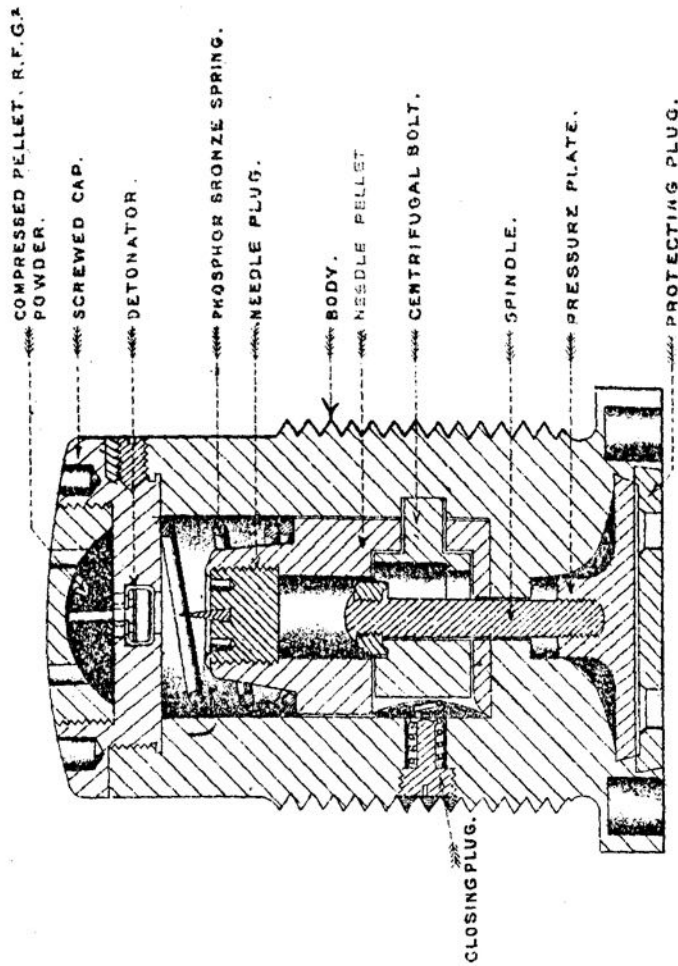
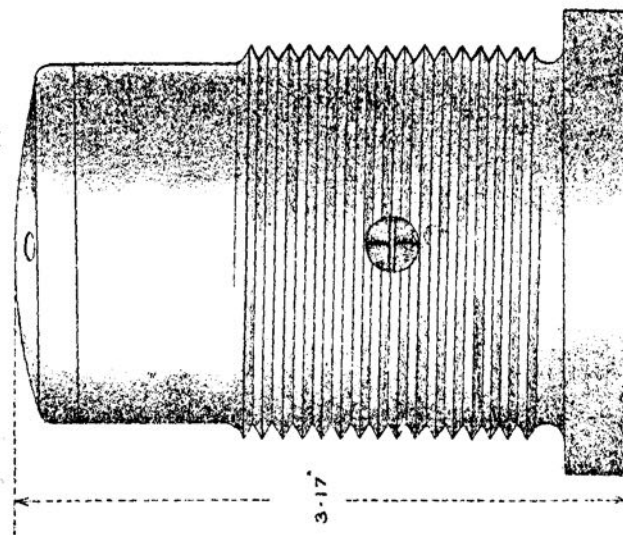
Mark IV (*Plate XXIII*) consists of the following parts:—Body, needle pellet, centrifugal bolt, pressure plate with spindle and nut, steel protecting plug, screwed cap with detonator and magazine, phosphor-bronze spring, brass spiral springs and four screws.

The body is turned and screwed on the exterior to suit the shell; the interior is bored out to receive the needle pellet and threaded at the top to receive the screwed cap; a hole is bored in the base for the spindle of the pressure plate to pass through; a recess is also formed in the base to take the pressure plate and protecting plug. A hole is bored through the side of the body and is closed with a brass screw plug with the end reduced to form a seating for a brass spiral spring which keeps the centrifugal bolt in position; a recess is also made in the opposite side of the body in which the small end of the centrifugal bolt engages. Two elongated holes are made in the base for screwing the fuze into the shell.

The needle pellet is cylindrical in form and rests on the bottom of the recess in the body; it is reduced at the top end to form a seating for the spiral spring which prevents the pellet working forward during flight. A hole is bored at right angles to the axis to take the centrifugal bolt; a hole is also bored longitudinally to take the spindle and nut of the pressure plate, and the upper part

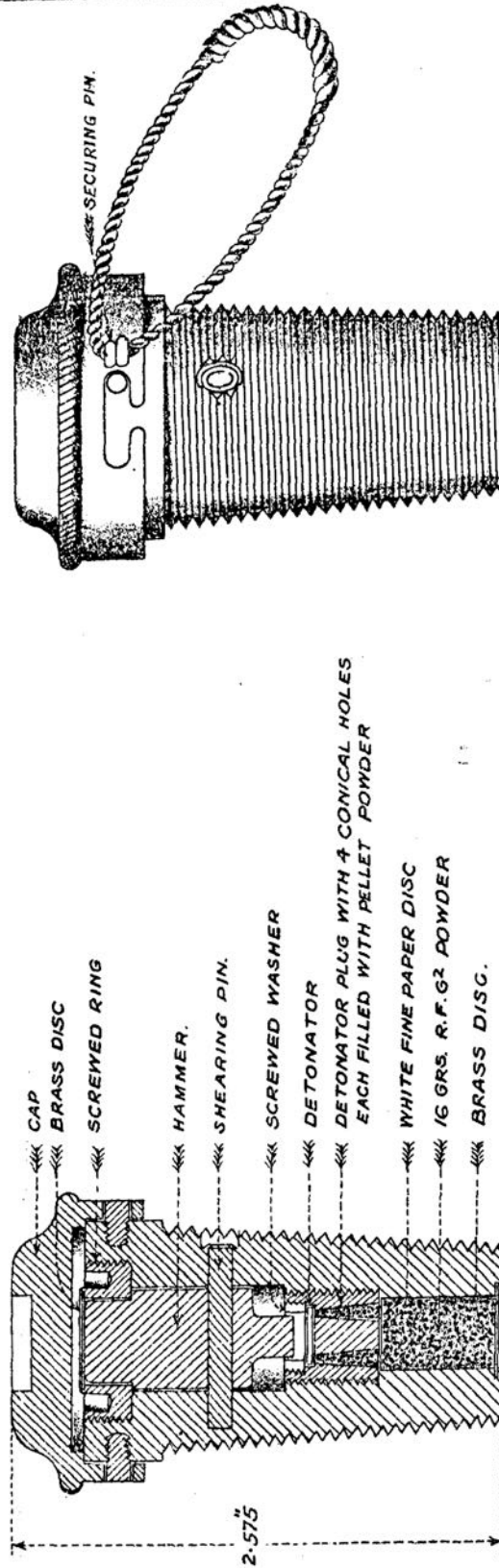
# FUZE, PERCUSSION, BASE, LARGE, N° II, MARK IV.

SCALE =  $\frac{1}{1}$ .



# FUZE, PERCUSSION, DIRECT ACTION, IMPACT, No 13, MARK IV.

SCALE - 1/1.



is threaded to receive the needle plug. The pellet is prevented from turning by a slot in the side engaging with a pin projecting from the side of the body.

The centrifugal bolt is cylindrical in form, and fits in the hole in the needle pellet; one end is reduced in diameter to fit in the hole inside the body made to receive it. An elongated hole is bored through it, and the upper surface on one side is recessed for the nut on the pressure plate spindle to engage in, thus locking the bolt till the pressure plate is crushed in.

The pressure plate has a boss on one side, into which the spindle is screwed; it fits in an undercut recess in the base of the fuze.

The protecting plug is perforated with eight holes and fits in an undercut recess, over the pressure plate, in the base of the fuze. It is intended to protect the pressure plate from accidental blows.

The screwed cap is in two parts screwed together, the two parts forming a magazine containing a perforated R.F.G.<sup>2</sup> powder pellet. A recess is made in the underside to receive the detonator which is spun in, and six fire holes are bored to convey the flash to the powder. A locking screw through the body of the fuze prevents the cap from unscrewing.

Weight of fuze 2lb. 8oz.

The fuzes are issued, wrapped in brown paper, one in a tin cylinder.

*Action.*—On discharge, the gas acting through the holes in the protecting plate causes the pressure plate to be crushed in, carrying forward the spindle and nut, thus releasing the centrifugal bolt. The rotation of the shell causes the centrifugal bolt to fly outwards, leaving the needle pellet free to move forward; on impact or graze the spiral spring is compressed, the needle fires the detonator and ignites the powder in the magazine, the flash of which passes through the holes in the cap and into the shell.

Mark III differs in having less protrusion of the centrifugal bolt into the body.

Mark II differs from Mark III in having no steel protecting plate.

Mark I differs from Mark II in the form of recess for the pressure plate, the shoulder of which is not so much cut away. The fuze is less sensitive since the pressure plate offers greater resistance.

Fuzes of early marks (except Mark II) when converted to the Mark IV pattern will have a star added to the numeral.

#### FUZE, PERCUSSION, DIRECT ACTION, IMPACT, No. 13.

(Plate XXIV.)

Mark IV fuze, which is of gunmetal, is screwed externally below the head to the G.S. gauge.

The head is turned and has a projection on each side to engage the cap with which the fuze is furnished.

The body is bored throughout its length and contains a hammer, detonator plug containing detonator, and 16 grains of R.F.G.<sup>3</sup> powder.

The hammer is held in suspension over the detonator by a shearing pin, which passes through the side of the fuze and is spun in.



The detonator plug has a recess in the top to take the detonator and has also four conical holes filled with pellet powder.

The detonator is secured in the plug by a brass screwed washer.

The fuze is closed at the head by a screwed ring with a brass disc spun in, and at the base with a brass disc spun in.

The cap has a T-shaped cut in each side of its rim to lock on the projections on the body, where it is further secured by a securing pin. The cap has also a square keyhole in the top to take the fuze key for screwing the fuze into the shell.

The fuze requires no preparation beyond removing the securing pin and cap at the moment of loading.

*Action.*—On impact the hammer is driven in shearing the steel pin and igniting the detonator, the flash passing through the detonator plug into the magazine.

Earlier marks of this fuze have been altered to conform to the Mark IV, a star being added to the numeral.

Weight of fuze, without cap, 10-oz.

„ „ cap, 3-oz.

These fuzes are issued one in a tin cylinder.

#### FUZE, TIME AND PERCUSSION, No. 64, Mark I.

This fuze is of metal, screwed to suit the G.S. fuze hole. It has two composition rings, the lower one being milled to facilitate setting.

To set the time arrangement, the cap is loosened with the fuze key provided, and the ring moved round until the required graduation is opposite the pointer, the cap is then tightened, great care being taken to screw it down as tightly as possible.

If the fuze is required to act as percussion, the "P" pin only should be removed, otherwise both pins should be removed. This however, should not be done until the moment of loading.

Weight about 1lb. 13oz.

The fuzes are issued one in a tin cylinder, 25 cylinders in a wood case.

#### FUZE, TIME AND PERCUSSION, MIDDLE, No. 54, MARK III.

(Plate XXV.)

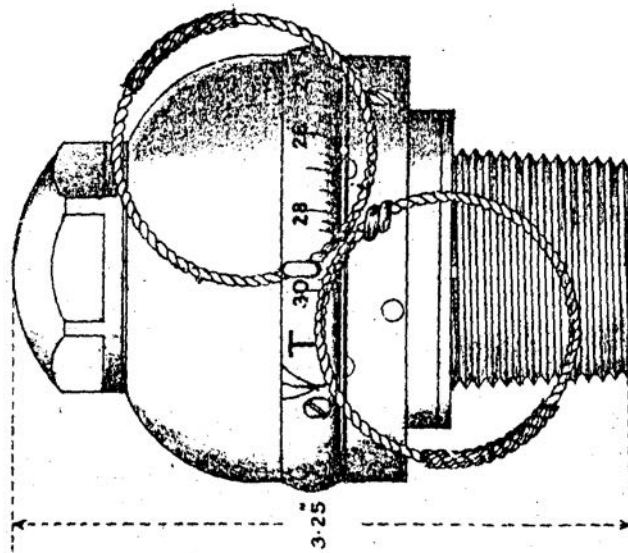
Mark III.—The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body for the gas to escape through. The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. Between the cap and the dome fits a brass washer with feathers fitting into slots on the stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a charge

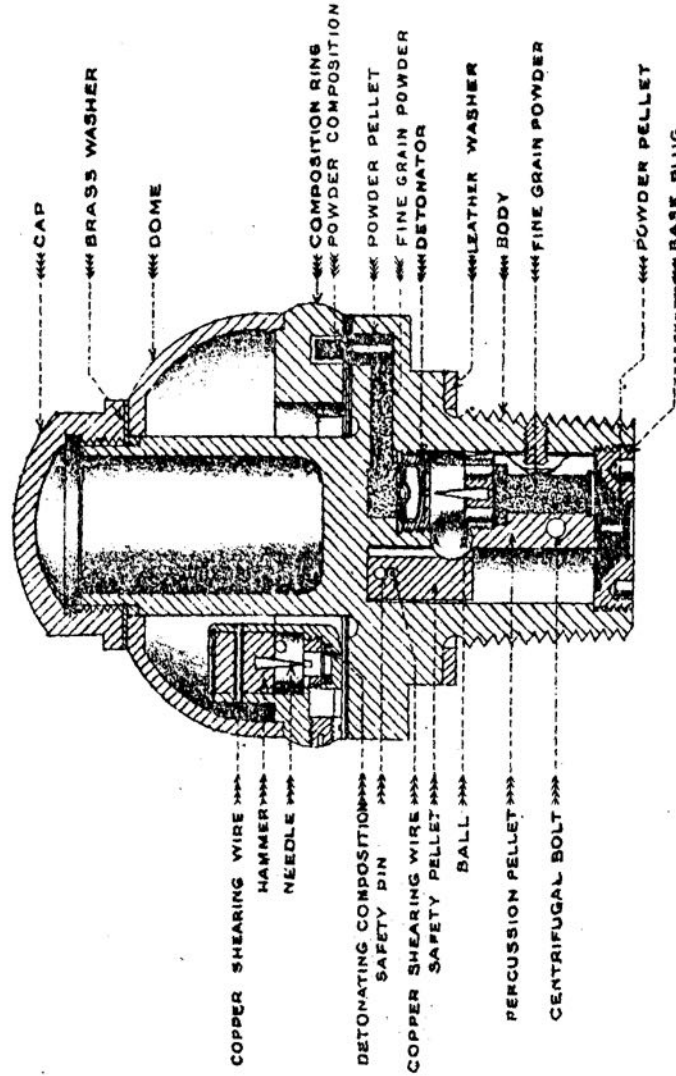


# FUZE, TIME AND PERCUSSION, MIDDLE; NO 54, MARK III

SCALE = 1/1



ELEVATION



SECTION

of F.G. powder, and then the needle plug, which is screwed in; the latter is perforated with six fire holes, and contains the steel needle. A small set screw in the body fits in a slot in the percussion pellet to prevent the latter turning during flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball and is suspended in the body by a thin copper wire passing through it. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *base plug* has a conical hole bored in it, and is closed at the bottom by a shalloon disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top. The plug is fixed by stabbing in three places.

The *composition ring* has an annular groove round it for the composition, a projection on the upper side contains the hammer with steel needle, suspended by a 0.022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it. The ring is barrel shaped outside to facilitate the setting of the fuze, and is kept in position by three projections on the side, which fit closely round the stem of the body. Two holes are bored through the top of the ring at the commencement of the composition and covered with paper. The ring is graduated from 0 to 30, and reads as quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

The body has an arrow head or black triangular mark on it for setting the fuze, opposite which is a hole from the surface to the percussion arrangement, filled with powder, for communicating the flash when the composition has burnt to it.

A small hole is made in the side to receive the pin in the semi-circular arm of the universal fuze key when screwing the fuze into the shell.

The fuze is stamped "T" on the ring close to the "time" safety pin, and "P" on the body close to the "percussion" pin to distinguish them. The time safety pin has a scarlet loop. If the fuze is required to act as percussion fuze only the "P" pin should be withdrawn, if as a time fuze only, the "T" pin, and if as a time and percussion fuze, both pins.

To set the time arrangement of the fuze, the nut is loosened with the "key, fuze, universal," and the ring moved round until the required graduation is opposite the arrow or black triangular mark on the body, the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30, or full length, is 16 seconds.

*Action.*—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition ;

this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

If the percussion pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet, and base plug, into the shell.

Weight ... .. 1lb. 4oz.

Fuzes which have been refitted with 0.35 grain detonators will have a star added to their numeral.

No. 54 fuzes will be superseded by No. 64 when existing stock is used up.

#### FUZES, DRILL.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt-out service time and percussion fuzes are used for this purpose.

To facilitate identification, the drill fuzes are stamped "DRILL" and bronzed.

#### TUBES, VENT-SEALING, ELECTRIC, WIRELESS, P.

##### (Plate XXVI.)

Mark V consists of a body, ebonite insulator for head, brass pole, brass nut, socket, ebonite cylinder, copper gascheck, brass gascheck, ebonite nut, crown metal contact piece, iridio-platinum wire bridge, brass washer, ebonite washer, 2 mica washers, asbestos ring, paper and glazed board discs, and cork plug.

The body is of brass with a screwed recess in the head to receive an ebonite insulator into which fits a crown metal contact piece, the latter being connected with the interior of the tube by a brass pole; the pole is insulated from the body of the tube by ebonite. The body of the tube is also bored out on the interior to take a brass socket.

To effect the internal gas sealing, the brass pole has a shoulder formed at the centre of it over which passes a copper gascheck, which is insulated from the pole by an ebonite cylinder. An asbestos ring is pressed into the copper gascheck and held by a brass gascheck and an ebonite nut screwed on to the brass pole.

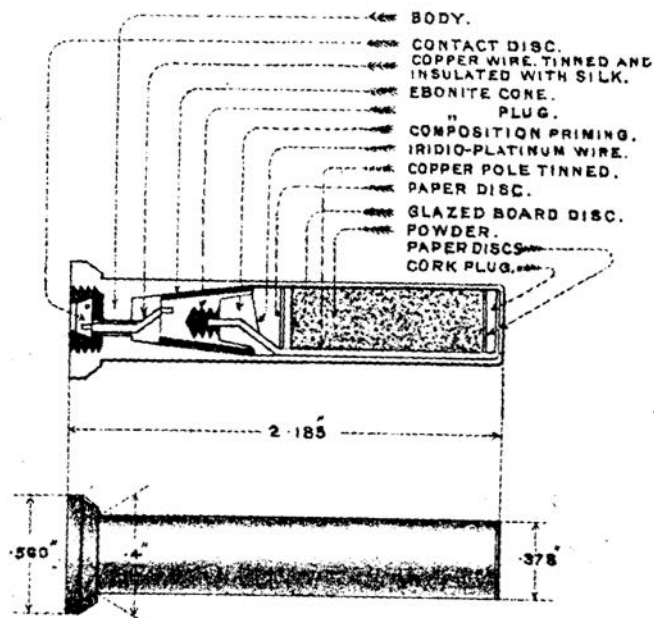
At the lower end of the copper gascheck a projection is made and bent inwards, the bridge (iridio-platinum wire) being formed from it to the brass pole. The bridge is surrounded by 2 to 3 grains of composition priming, under which is placed a glazed board and paper disc.

The tube is filled with about 23 grains of pellet powder, the end of the tube being closed by discs of paper and a cork plug, and further secured by the end of the tube being burred over.

*Action.*—On contact being made the current passes through the striker, brass pole, bridge, copper gascheck and the body of the tube. The bridge becomes incandescent, which fires the priming and powder; the copper gascheck between the brass socket in the body and the shoulder on the brass pole prevents the escape of gas through the head.

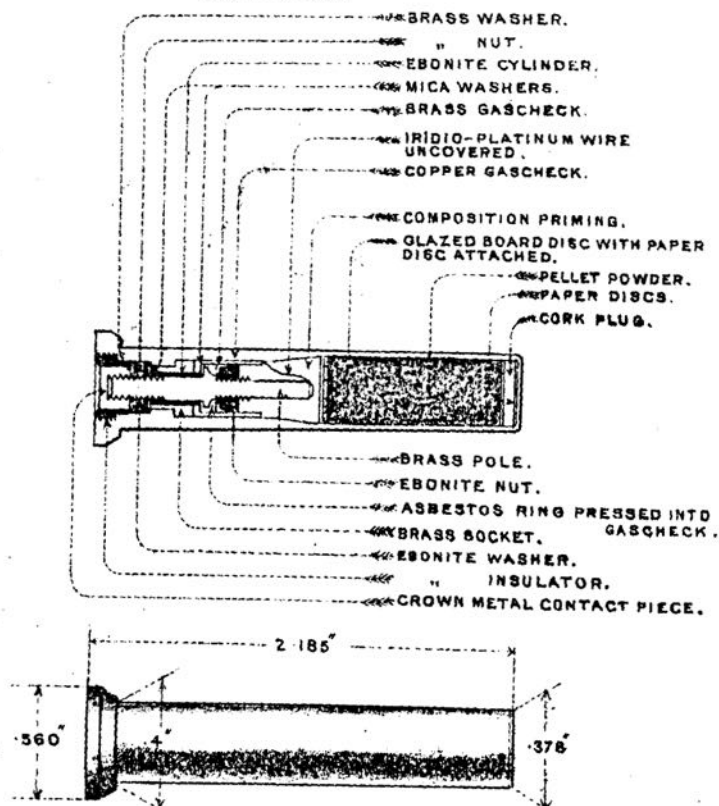
# TUBE, VENT SEALING, ELECTRIC, WIRELESS, P. MARK IV.

SCALE =  $\frac{1}{1}$ .



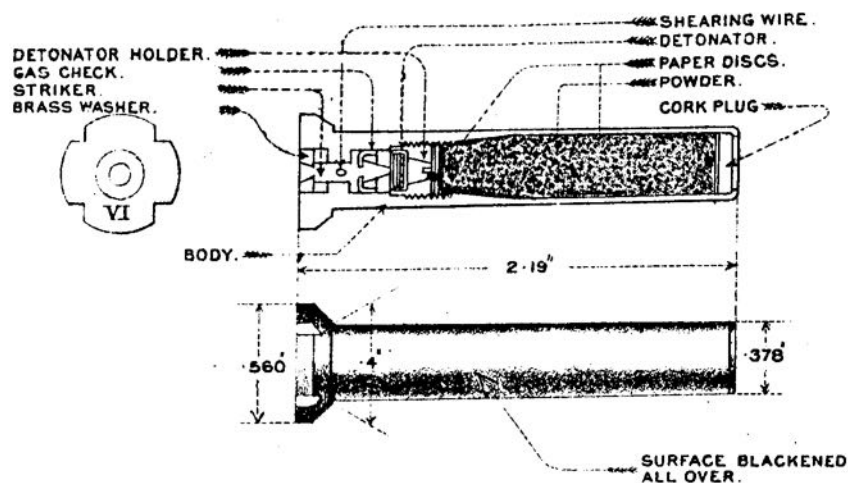
# TUBE, VENT SEALING, ELECTRIC, WIRELESS, P. MARK V.

SCALE =  $\frac{1}{1}$ .



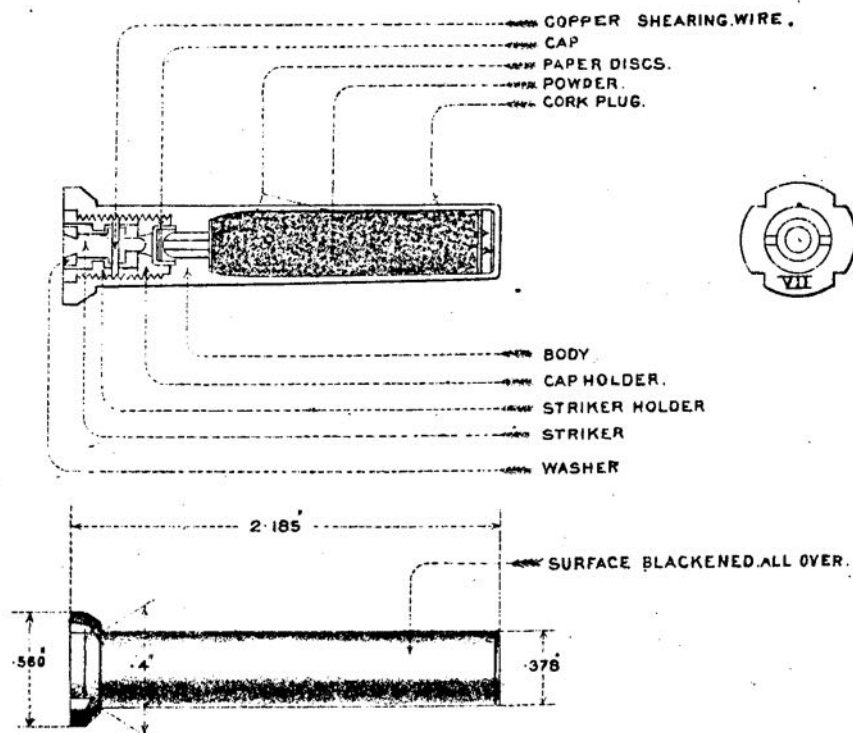
# TUBE, VENT SEALING, PERCUSSION, MARK VI.

SCALE -  $\frac{1}{1}$ .



# TUBE, VENT SEALING, PERCUSSION, MARK VII.

SCALE -  $\frac{1}{1}$ .



Packed. 10 in a tin box.

Mark IV consists of a body, conical brass plug, copper pole, cork plug, ebonite cup, ebonite plug, hollow ebonite cone, insulated copper wire, glazed board and paper discs, and an iridio-platinum wire bridge.

The body is made of brass, with a recess in the head to receive an ebonite cup which is screwed into the head of the tube, and into which fits a pure tin contact disc, secured by an undercut groove in the ebonite, and connected by an insulated copper wire with the interior of the tube; a hole is bored through the head of the tube for the copper wire to pass through. The lower end of the insulated wire is attached to the brass conical plug, which is insulated from the body of the tube by the hollow ebonite cone. The large end of the brass cone is cupped out to form a gascheck, and has a centre hole bored and screwed to receive an ebonite plug. Into this ebonite plug is fixed a copper pole, which consists of a copper wire, coated with pure tin, one end fitting into the ebonite plug, the other being secured to the side of the tube.

The copper pole and conical brass plug are connected by a single bridge of iridio-platinum "wire, uncovered, Z13." The space round the bridge and pole is charged with 2 grains of composition priming, under which is placed a perforated glazed board disc with paper disc attached.

The tube is filled with pellet powder, and the end is closed by discs of paper and a cork plug shellaced in and further secured (in later manufacture) by the end of the tube being burred over.

*Action.*—On contact being made the current passes through the striker, contact disc, short wire, cone, bridge, long copper pole, and the body of the tube. The bridge becomes incandescent, which fires the priming and powder, the gas expands the cupped-out cone and prevents the escape of gas through the head.

Mark III tube differs from Mark IV by having a bridge of platinum silver, and only a paper disc intervening between the priming composition and the powder.

Mark II. *This mark is not to be used in adapters for service practice from this gun.*

Mark I. *This mark will be used up for drill and instructional purposes only.*

#### TUBES, VENT-SEALING, PERCUSSION.

(Plate XXVII.)

Mark VII consists of a body, cap, cap-holder, striker, brass washer, copper shearing wire, striker holder, two paper discs and a cork plug.

The body is of brass; the head is bored centrally to receive the cap and striker, the front end of this recess is formed into a raised anvil through which two fire channels are bored. The cap is held in position on the anvil by the cap-holder, and above the latter is screwed the striker holder in which is secured the striker by a copper shearing wire, and by being riveted at its outer end to a brass washer.

The lower part of the tube is filled with 32 grains of pellet powder. The tube is closed with a paper disc and cork plug, which is coated



with varnish, and further secured by the end of the tube being burred over.

Percussion V.S. tubes of present manufacture are blackened all over, and have four notches cut in the rim of the head to distinguish them from wireless electric tubes by sight or touch.

*Action.*—On firing the gun the point of the striker of the percussion lock drives the striker of the tube together with the cap on to the anvil, thus firing the tube.

Mark VI consists of a body, striker, detonator, detonator holder, two washers, shearing wire, two paper discs, and cork plug.

The body is of solid drawn brass; the head is bored centrally for the striker, detonator, and fire channel. The striker is of brass with a needle point, and a plain flange at its base, under which is fitted a copper cup-shaped gascheck; it is held in position by a copper shearing wire passed through the tube, and a brass washer in the recessed head of the tube. The detonator is fitted into the holder, and the latter is screwed into the body of the tube. Under the detonator holder is a copper washer, and a disc of fine white paper. The lower part of the tube is filled with pellet powder. The tube is closed with a paper disc, and cork plug which is coated with varnish, and further secured by the end of the tube being burred over.

*Action.*—On firing the gun the point of the striker of the percussion lock drives the striker of the tube on to the detonator, thus firing the tube, the flash passing on to the charge.

Mark V tube differs from Mark VI in the form of the striker, which is without the cup-shaped gascheck, and the detonator which is held in position by a brass-screwed collar. *This Mark will be used up for drill and instructional purposes only.*

Mark IV.—This consists of a body, anvil, striker, brass washer, percussion cap, copper washer, two paper discs, and a cork plug. The body is made of brass, solid drawn; a hole is drilled through the head to receive the striker, which is secured in position by being riveted into the countersunk washer. The upper part of the chamber is screwed and fitted with an anvil, on which is placed the percussion cap, the upper surface of which is in contact with the striker; a small central and two diagonal fire-holes are drilled through the anvil. The remainder of the space in the tube is filled with pellet powder, and the bottom is closed with a paper disc, and cork plug coated with varnish.

*Action.*—This is the same as Mark VI tube, except that the striker of the tube together with the percussion cap, is driven on to the anvil thus firing the tube.

Mark III is the same as Mark IV, except that the bottom of the tube is closed with a paper disc and perforated brass ball, embedded in sulphur and secured with shellac. *It must not be used unless the range is clear; see also Note below. This Mark will be used up for drill and instructional purposes.*

Mark II tube differs from Mark IV in not having the diagonal fire-holes in the anvil.

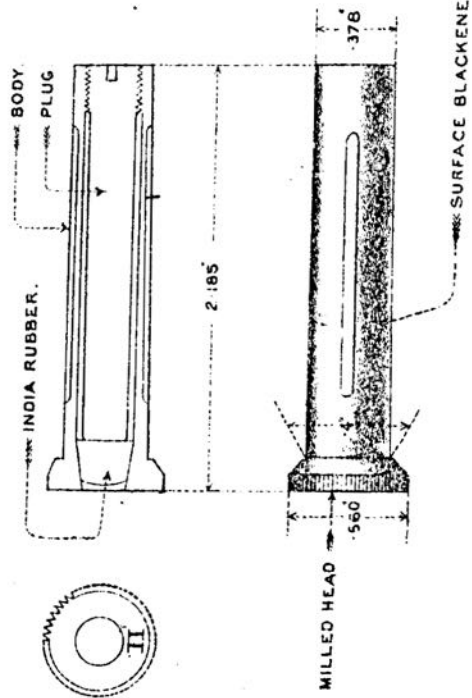
These tubes are packed 10 in a tin box.

*NOTE.*—Care must be taken to see that the range is clear when using vent-sealing tubes with ball (Mark III percussion), for clearing the vent or for any other purpose, as the brass ball is projected with considerable velocity by the powder in the tube.



# TUBE, VENT SEALING, PERCUSSION, DRILL, MARK II.

SCALE  $\frac{1}{16}$  IN.



## TUBES, VENT-SEALING, PERCUSSION, DRILL.

(Plate XXVIII.)

Mark II is of gunmetal and of the same external dimensions as the Service V.S. percussion tube; the body is blackened all over, four longitudinal grooves are cut in the body, and the rim of the head is milled, to distinguish it by sight or touch from other tubes.

Internally it is bored out and fitted with a coned plug of rubber secured in position by a gunmetal plug screwed in the front end.

Mark I differs from Mark II in being much shorter, and in not being blackened, grooved or milled.

## DRILL FOR 6-INCH Q.F. GUNS.

The gun detachment consists of a Gun Captain, two Gun Layers, Setter\* and 8 other gun numbers. It falls in and is told off in the usual manner.

## AMMUNITION SUPPLY.

Cartridges are supplied from recesses (or depôts if required) in the emplacement, by hand to the gun platform. A proportion of these should be prepared for percussion firing, before action. Supply may also be made to the level of the emplacement by lift.

Projectiles are supplied from recesses in the emplacement, and from depôts, which should be arranged round the emplacement floor under cover of the parapet. Supply may also be made to the level of the gun platform by lift.

The normal supply of ammunition will be from the recesses or depôts; in this case 6 and 8 working alternately, supply 3 or 5 with cartridges, and 7 and 9 lift projectiles on to the gun platform. This supply must be made intelligently, as the gun is traversed, from the most convenient recess or depôt.

When supply is from lifts, 6 and 8 will work in a similar manner, keeping 3 or 5 supplied by the shortest way; 3 and 5 pick up and load projectiles alternately, 7 and 9 go below to assist the ammunition detail.

Empties will be stacked by 6 and 8 without obstructing the working numbers at the gun.

As the recesses only hold a limited number of rounds it will be advisable not to reduce the total for each gun below 12, and when this point has been reached, to change to lift supply.

In addition to the above detail, when guns are served by lifts direct from both shell and cartridge stores, 6 additional numbers will be required to supply and work the lifts.

\* The Setter will be taken from the 50% spare.

## TO PREPARE FOR ACTION.

Gun Group Commander.	Gun Captain.
"A Group, Prepare for Action."	"A 1, Prepare for Action."

At this order stores are brought up as follows :—

Gun Captain.—Gauge protrusion striker.

Gun Layers.—Electric firing battery (if not on mounting), box of spare parts and tools, sights and pistol grip.

2.—One tray, stores, complete.\*

3.—Percussion tubes and tube box (if latter is not already on mounting), empty cartridge case with primer.

4.—Rammer.

5.—Assists 3.

6 and 8.—Keys of cartridge and shell recesses ; 1 key, inserting primers, 1 key, removing primers, and 1 cartridge holder. For drill, a drill cartridge, adapter, and drill tube.

7 and 9.—Brush ; 2 keys, fuze, universal ; 2 keys, base fuze and plug (when required) and grease box. For drill, a drill shell and shell extractor. Gun floor numbers knee caps.

The following Group and Battery Stores will be brought up and such others as are considered necessary locally :—

*Battery Stores.*

Bar testing sight ... ..	1 per work.
Clinometers, large ... ..	"
Instruments, testing primary batteries or voltmeter ... ..	"

*Group Stores.*

Hammers, claw, 28 oz. ... ..	1 per group.
Pliers, side cutting, 8-inch ... ..	"
Rammers ... ..	"
Whistles ... ..	"

The G.G.C. will personally test the protrusion of the striker of all the guns in his group, with the breech open and the lever in the closed position. When the lever is in the open position, he will see that the point of the firing pin is within the face of the breech screw ; he will also examine the nuts on the sheath and those on the striker needle to see that they are properly tightened up.

N.B.—To gauge the protrusion of the striker, swing the breech screw and carrier into the loading position, then release the catch retaining breech screw by hand, and turn the screw into the locked position. Make sure that the striker is correctly assembled, insulating washers in position, needle assembling nuts screwed home. The striker must then be pulled to the rear, but only with sufficient force to take up any clearance due to wear in the thrust collars.

\* Contents of tray, stores :—

2 Boxes, tube, garrison  
(1 spare to hold spare parts).  
1 Can, lubricating, No. 9.  
1 Piece of chalk.  
1 Screwdriver, G.S. 4-in.  
1 Screwdriver, No. 13.  
1 Cartridge extractor.  
1 Firing lanyard,

1 Wrench, B.M. No. 65.  
1 " " " 66.  
1 " " " 67.  
1 " " " 78.  
1 Striker E. and P.  
1 Spanner, No. 188.  
1 McMahon Spanner, 15-inch  
Waste,

The "gauge, striker, protrusion," will then be applied over the point of the striker. It should also be ascertained, by inspection, that the point of the needle is within the face of the bush in the breech screw when the breech is open.

The Gun Captain will satisfy himself that the buffer is properly connected up, not leaking at the glands, and contains the correct amount of oil; that the capsquares are properly secured, and that the lubricators on the top of the cradle are filled with oil. When the breech is opened he looks to see that the bore is clear. He superintends the firing of an electric and a percussion tube to test the firing arrangements. He receives reports, from the numbers responsible, of any irregularity or deficiency in connection with the different parts of the gun, mounting, or stores.

The Gun Layers fix the sights in the cradle and see that they fit and work properly and that the sight carriers or brackets are firmly attached to the mounting; test the sights and elevation indicator, place the pistol grip in position, examine the striker, place it in position, gauge its protrusion and test the firing circuit. They see that the elevating and traversing gears are oiled and in good working order. Uncover the dials and see that they are properly connected up.

2. Places the oil can and waste in a convenient position on the mounting and his other stores handy for use, he then examines the breech screw and threads of the breech, sees that they are clean and free from burrs and lubricates the threads with a slight film of oil.

3. Removes the breech and muzzle covers, attaches tube box with percussion tubes to left side of mounting. (If the box is already on the mounting, places tubes in box.) Loads empty cartridge case fitted with an electric primer, or adapter and tube, as soon as the breech is opened.

4. Places the rammer in a convenient position for use and assists the layers.

5 assists 3.

6 and 8 go to the recesses or head of the cartridge lift and prepare to issue cartridges; for drill they place the drill cartridges ready for use.

7 and 9 go to the shell depots or recesses (or shell lift and shell store if supply is by the lift) and prepare shell for loading, *i.e.*, clean and fuze them. For drill they place the drill shell and extractor in a convenient position for use.

The group and battery stores are placed in their allotted position.

After each number has completed his work, he takes post as follows:—

\* Gun Captain on the left side of the rammer.

Gun Layers on the sighting steps.

2 in rear of gun in prolongation of right side of gun, left foot in front, facing auto-sight layer.

3 close up to breech on left side and facing 2.

\* 4 in rear of 2 right foot advanced.

5 to rear of 3.

6, 7, 8, and 9 as above detailed.

Setter according to case of laying.

\* If for physical reasons No. 4 is considered a better "Rammer Number" than the G.C., the positions of G.C. and No. 4 may be reversed and in Action No. 4 will ram and the G.C. extract empty cartridge cases.

The safety arrangements of the gun can now be tested under the superintendence of the G.G.C. as follows:—

He will direct the Gun Layer to keep the trigger firmly pressed, while **2** closes the breech, by pushing the lever from him with his right hand, until the breech screw is locked. In this position, the primer should not fire, as the safety stop is still holding the striker back. The final movement of the lever and safety stop, in fully closing the breech, should fire the primer.

**2** then opens the breech, **4** extracts the empty cartridge case, using the extractor with his left hand, and **2** closes the breech again.

The Gun Captain collects reports from each number regarding any damage or deficiency. He then places his men under cover and reports to G.G.C. "Bore clear, ready to load."

#### To Load.

Gun Group Commander.

Gun Captain.

"A Group ..... Load."

"A 1 ..... Load."

*Electric Firing.*—**2** opens the breech by taking hold of the breech mechanism lever with his right hand and pulling it towards him as far as it will come.

**7** or **9** place projectile on gun floor.

**3** picks up projectile, keeping C.G. supported on his left arm and steadying base with his right hand, fist clenched. As breech screw swings open, he slides projectile into chamber by leaning forward, and swings round on his hips to his right to receive cartridge handed to him by **5**, who has received it from **6**.

Gun Captain rams home in one motion, outer hand back up inner hand back down. Withdraws rammer smartly and stands by to load next round, with rammer head just clear of recoil.

(NOTE.—When loading lyddite shell, the safety pin is withdrawn during supply from recesses by **7** or **9** before lifting shell on to gun floor. At lift supply, **3** or **5** before picking up shell removes the safety pin and uncaps the fuze.)

**3** loads cartridge and gives "In."

**2** then closes the breech with his right hand, assisted if necessary by **4**, and gives "Ready." (At percussion firing **3** hooks lanyard and gives "Ready.")

**3** after loading steps back. **5** closes up with projectile. **3** receives cartridge from **6** and stands to right rear of **5** ready to hand cartridge to him. In this way, **3** and **5** load alternately.

As soon as the gun has fired, **2** opens the breech with his right hand, **4** extracts the empty cartridge case with his left hand, and supporting the centre with his right hand, raises it and throws it clear to his left rear. (He should wear a leather glove on his right hand.)

*Percussion Firing.*—As above, with the following exceptions:—

After **3** or **5** has entered the cartridge with adapter, but with no tube, **2** closes the breech, to ascertain that the charge is home, then opens the breech carefully so as not to work the extractor, and when **3** or **5** has put in the tube, closes it carefully to avoid jarring the tube. He then cocks the striker, by pulling it to the rear till caught by the trigger, **3** or **5** attaches the lanyard, **3** or **5** gives the word "Ready," when all clear of recoil and stands ready to fire.

## CEASE FIRING.

On the command from the G.G.C. "A Group, Cease Firing," the Gun Captain gives the group letter and number of his gun followed by the command "Cease Firing."

*Electric firing.*—2 pulls the lever towards him sufficiently to draw back the striker from the tube or primer.

*Percussion Firing.*—3 or 5 unhooks the lanyard; 2 pulls the lever towards him sufficiently to draw back the striker from the tube.

## STAND FAST.

On "Stand Fast" being ordered, 2 will pull the lever towards him sufficiently to draw back the striker from the tube or primer, all numbers will then stand fast and wait for the next word of command. The gun is again made Ready on the order "Go On" being given.

## 1. AUTOMATIC SIGHT.

## To LAY.

The gun layers adjust their deflection scales to the deflection ordered, repeating alterations. The auto-layer sets the tide lever and the error of the day drum as ordered, and repeats all alterations.

Rocking-bar Layer lays for line and traverses.

Auto-layer lays for elevation and fires and, if ordered to do so, corrects by means of the error of the day drum.

## To FIRE.

(a) Electric Firing. The gun layers lay on the target and continue to follow it.

At Deliberate or Salvo Fire, they await the order or signal from the Gun Group Commander.\* On receipt of this order or signal, the Auto-Layer will fire the gun by pressing the trigger, as soon as the gun is laid.

At Independent Fire, the Auto-Layer fires as soon as possible after "Ready" is given.

(b) Percussion Firing. Same as (a) except that 3 or 5 fires on order "Fire" from Auto-Layer.

## 2. CASE I. ROCKING-BAR SIGHT.

## To LAY.

The Setter will set the Rocking-bar sight to the range (corrected for Group Difference, if any). The Setter and the Auto-Layer repeat the deflection ordered by the Gun Group Commander, and put it on their sights.

The Rocking-bar layer lays and fires, traversing himself, and giving "elevate" or "depress" to the Auto-layer.

## To FIRE.

(a) Electric Firing. Same as with auto-sight except that Rocking-bar layer fires by means of the pistol grip.

(b) Percussion Firing. Same as with Auto-sights except that the rocking-bar layer orders 3 or 5 to fire.

\* The setter will, if necessary, pass the order on to the Layer.

## 3. CASE II.

To LAY.

The Rocking-bar Layer and Setter take post at the elevation indicator and electric range dial respectively, and the Auto-layer at the auto-sight. The Setter calls ranges to the Rocking-bar Layer, who keeps the gun layed for elevation.

To FIRE.

(a) Electric Firing.—At Deliberate or Salvo Fire they await the order or signal to fire from the Gun Group Commander.\* On receipt of this order or signal, the Rocking-bar Layer completes the operation of laying for elevation and gives "ON." At this caution, the Auto-layer will fire, when layed for line.

At Independent Fire, the Rocking-bar Layer gives "ON" as soon as possible after "Ready" is given.

(b) Percussion Firing.—Same as (a), except that 3 or 5 fires on the order "Fire" from the Auto-layer.

## 4. CASE III.

Auto-sight layer reads training dial and traverses. Rocking-bar layer and setter as at Case II. Auto-sight layer fires.

AFTER FIRING.

As soon as the gun is fired, 3 or 5 unhooks the lanyard (if at percussion firing), 2 opens the breech. The gun will be at once reloaded.

For "Action," "Under Cover," "Replacement of Casualties," "Detachment Rear" (see G.A.T., Vol. I).

The positions under cover are as follows:—

- 2, 4, and Gun Captain on the right of the gun.
- 3, 5, and Gun Layers on the left of the gun.
- 6, 7, 8, 9, in rear of the gun.

MISSFIRE.

G.G.C.

Gun Layer.

"A 1 ..... Missfire."

*Electric Firing.*—If, when the Gun Layer presses the trigger, the gun fails to fire, he will call out "Close the Breech," and at the same time release the trigger; the Gun Captain will give the L.B.M. a tap with the rammer, and will ascertain by inspection that it is home; he then calls "Ready." The Gun Layer will then again press the trigger, and if the gun again missfires, he will hold the trigger pressed while he counts four in slow time; and, if it fails to fire, will call "A 1, Missfire," at the same time releasing the trigger. A pause of five minutes will be made (during which time the detachment, except the Gun Captain and 2 and 3 will take cover).

NOTE.—In peace practice, the Gun Layer will keep the gun layed in a safe direction.

\* The setter will, if necessary, pass the order on to the Layer.



At the end of five minutes, all men, except Gun Captain and all cartridges, will be moved to a position of safety.

The Gun Captain will then place himself clear of the breech on the left side and open the breech by applying the rammer to the lever breech mechanism. After a further pause of one minute, the Gun Captain, still keeping clear of the breech, will remove the cartridge with extractor and have it placed on one side clear of the gun. When practice is finished the primer will be exchanged or the adapter removed and the tube exchanged. If the primer or tube has fired without igniting the cartridge, the cartridge will be set aside for special examination.

To locate whether the fault is in the primer (or tube) or the circuit proceed as follows:—

If no deflection is given by pistol grip, during the pause of five minutes the Gun Captain, 2 and 3, will look round the circuit, keeping clear of recoil, and see if the fault is palpable and immediately remediable (such as lever breech mechanism not home, contacts "A" or "B" worked out, binding screws loose, &c.). If so, the fault will be remedied and fire continued. At the end of one minute, as soon as the cartridge is extracted, short circuit point of firing pin and breech screw, and see if there is a deflection. If there is a deflection, continue with electric firing, if not, change to percussion.

If deflection is given by pistol grip, look for a short circuit during pause, and if not found, as soon as cartridge is extracted put lever breech mechanism in closed position and press lever, if there is a deflection, change to percussion, unless the cause of short circuit is at once discovered, *e.g.* a blow back.

If there is no deflection, short circuit needle to breech screw and press lever, then, if there is no deflection change to percussion.

*Percussion firing.*—On a missfire occurring, the Gun Layer will call out "A.1., Missfire." 2 recocks and gives the L.B.M. a tap, makes fast the lanyard, and the tube is again tried. Should it again fail to fire, the detachment, except the Gun Layer, should take cover, and proceed as for electric firing. The striker will be examined, a new cartridge will be put in, the breech closed, and the cartridge tried. Should this also missfire, after a further pause as for electric, the striker will be removed and sent away for examination and repair, if necessary, and a fresh one substituted.

It is most important that percussion firing should not be resorted to except as a last resource, and every care should consequently be taken of the firing circuit. At the same time, it is even more important that guns should be kept in action. If, therefore, a missfire occurs, steps should at once be taken to see whether the fault lies in the primer (or tube) or the circuit, and if the latter (if not immediately remediable) change should at once be made to percussion firing, and at the first pause in the firing, the fault should be discovered and rectified.

#### TO CEASE FIRING AND REPLACE STORES.

All stores are replaced by the numbers who brought them up, and the gun is left under metal by the Gun Layer; the detachment then fall in at "Detachment rear."

Para. of L. of C.	Nature of Change.	Remarks.

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